Draft Environmental Impact Statement Expansion of Port of Camas-Washougal Industrial Park Washougal, Washington

U.S. DEPARTMENT OF COMMERCE
Economic Development Administration

DRAFT ENVIRONMENTAL IMPACT STATEMENT

EXPANSION OF PORT OF CAMAS-WASHOUGAL INDUSTRIAL PARK

Washougal, Washington

U.S. DEPARTMENT OF COMMERCE
Economic Development Administration
Washington, D.C. 20230

December 1978

Transmittal to the Environmental Protection Agency

Check one (√) Draft ( ) Final Environmental Statement

Name of Responsible Federal Agency: Economic Development Administration, U.S. Department of Commerce

1. Name of Action: (check one) (√) Administrative Action
   ( ) Legislative Action

2. Brief description of action indicating what States (and counties) are particularly affected.
   The proposed project is expansion of the existing Port of Camas-Washougal Industrial Park, located in the City of Washougal, Clark County, Washington. The principal objective is to foster economic development by increasing industrial employment and diversifying the economic base of Washougal and southern Clark County. Land adjacent to the existing industrial park will be prepared for occupancy by small and medium-sized industrial firms.

3. Summary of environmental impact and adverse environmental effects.
   This project will result in the creation of approximately 1,000 new, permanent jobs over a 9-year period, which will reduce the dependence of the local economy on the two current major employers. Demand for local goods and services and government tax revenues will be increased.

Except for 8 acres, the 140-acre project site will be converted from open space in agricultural use to industrial use. The pleasing agricultural character of the area will be unavoidably and negatively modified. Development of the project site will probably accelerate industrial development of the adjoining land. Also, land in other parts of the county and city will be more rapidly converted to residential and commercial uses to accommodate new employees and their families. Wildlife will be nearly eliminated on the 140-acre expansion site, and will be disturbed on adjacent land. Movement of animals from the Columbia River shoreline to the grasslands and wetlands adjacent to the project site will be hindered or blocked. Development of adjoining land would seriously compromise the ecological integrity of the area; it is unlikely that the value of the wetlands could be maintained at their present level. Air pollutant emissions will be greater than they would be without the expansion, even with major efforts at mitigation, although less than now because of improved control of auto emissions. Population growth induced by the expansion will increase demands for public services, especially schools and fire and police protection. The increased demands must be anticipated and planned for to minimize potential adverse effects.

4. List alternatives considered:
   a. No further development

   b. Development at other locations in Clark County

   c. Development of other acreage behind the dike

   d. Project as proposed, without EDA funding

   e. Development with greenway

   f. Development with wetlands reserve

   g. Development with flood protection reserve

   h. Development with creek realignment.

5. List all Federal, State, and local agencies from which comments have been requested:

Honorable Mike McCormack
U.S. Fish and Wildlife Service
Bonneville Power Administration
U.S. Corps of Engineers
U.S. Environmental Protection Agency
National Marine Fisheries
U.S. Department of Agriculture
U.S. Department of Health, Education, and Welfare
U.S. Department of Housing and Urban Development
U.S. Department of Transportation
Advisory Council on Historic Preservation
Council on Environmental Quality
Washington Department of Fisheries
Washington Department of Game
Washington Department of Ecology
Washington State Historic Preservation Officer
Washington State Clearinghouse
Washington State Office of Community Development
Washington Department of Community and Economic Development
Washington Association of Conservation Districts
Washington State Conservation Commission
Washington State Department of Natural Resources
Oregon Division of State Lands
Oregon Department of Land Conservation and Development
Oregon Soil and Water Conservation Commission
Oregon State Columbia River Gorge Commission
Oregon State Department of Environmental Quality
Oregon State Department of Fish and Wildlife
Oregon State Marine Board
Oregon State Water Resources Department
Washougal School District
Camas School District

Washougal Shoreline Management Review Committee
Washougal Park Board
City of Washougal
City of Camas
Port of Cams-Washougal
Clark County Board of Commissioners
Clark County Public Utility District
Clark County Sewer District
Regional Planning Council of Clark County
Clark County Council
Parametrix
Columbia River Conservation League
Columbia River Fisherman's Protective Union
Clatsop Environmental Council
Defenders' of Wildlife
Friends of the Earth
Books Plus
The Humane Society of the United States
Lower Columbia Basin Audubon Society
National Wildlife Federation
The Nature Conservancy
1000 Friends of Oregon
Oregon Environmental Council
Oregon League of Environmental Voters
Oregon Natural Heritage
Oregon Parks & Recreation Society
Oregon Shores Conservation Coalition
Oregon Wildlife Federation
Sierra Club, Pacific Northwest Chapter
Seattle Audubon Society
Soil Conservation Society of America
Steelhead Trout Club of Washington
Izaak Walton League of America, Inc.
Oregon Student Public Interest Group
University of Washington Public Interest Group
Washington Bass Chapter Federation
Washington Cooperative Fishery Research Unit, U.S.D.I.
Washington Environmental Council, Inc.
Washington State Sportsmans Council
Wildlife Management Institute
Wildlife Society Oregon Chapter
Wildlife Society Washington Chapter
Gibbons Creek Conservation Society
League of Woman Voters

A copy of this draft environmental statement is also available for review at the following libraries:

Washougal Public Library
Camas Public Library

6. Date made available to EPA and the public:

The Draft Statement was made available to the Environmental Protection Agency (EPA) and the Public on:

FOREWORD

The Port of Camas-Washougal, State of Washington, proposes to use grants totaling $1,215,000 from the Economic Development Administration (EDA), U.S. Department of Commerce, to begin expansion of its present industrial park. The proposed project will increase industrial employment and diversify the economic base of the Camas-Washougal area. Grant funds will be used to grade the project site, and to construct access roads, railroad spurs, and water, sewage, and storm drainage facilities.

EDA has made prior grants to the Port. A Public Works grant in 1973 was used to continue development of the present industrial park. In 1976, EDA funded a feasibility study and environmental impact assessment of further expansion. The Port is now requesting funds to carry out a proposed expansion plan: $375,000 has been requested under the supplemental grant program of Section 304 of the Public Works and Economic Development Act; an additional $840,000 has been requested under the Local Public Works (LPW) program established by the Public Works Employment Act. The State of Washington, through its Economic Assistance Authority, has agreed to lend $125,000 to the Port to match the 304 funds from EDA.

The National Environmental Policy Act of 1969 requires that an Environmental Impact Statement (EIS) be prepared for any major federal action that may significantly affect the quality of the human environment. This document is a Draft EIS for the proposed award of federal funds to the Port of Camas-Washougal by EDA. It was prepared by SRI International, Menlo Park, California.*

This Draft EIS describes the current natural and socioeconomic features of the proposed project and the Camas-Washougal area. The

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essential features of the proposed industrial park expansion are also described. Then, the probable effects on the natural and socioeconomic conditions if the proposed project is carried out are assessed. The analysis relied on available documents (see References) and on interviews with individuals who have pertinent knowledge of the Camas-Washougal environment, as well as on interviews with both proponents and opponents of the project.

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ILLUSTRATIONS

I DESCRIPTION OF PROJECT

A. Proposed Project and Principal Involved Agencies

Expansion of the existing Port of Camas-Washougal Industrial Park, located in Washougal, Washington, is analyzed in this document. The Port of Camas-Washougal has applied to the Economic Development Administration (EDA) of the U.S. Department of Commerce for grants to finance initiation of the proposed project. It has also applied to the Washington Economic Assistance Authority (EAA) for matching funds.

The Port, which was formed under the laws of the State of Washington, will be responsible for carrying out the proposed project. As a public port district it is the only public entity that may raise funds and incur indebtedness for economic development.

B. Objectives

Award of the requested grants will enable the Port of Camas-Washougal to begin expansion of its existing industrial park. The principal objective of the proposed project is to increase industrial employment and diversify the economic base of the Camas-Washougal area. Land adjacent to the existing industrial park will be prepared for occupancy by small and medium-sized industrial firms. Site preparation will include grading and the construction of access roads, railroad spurs, and water, sewage, and storm drainage facilities. The project will meet the apparent need for developed sites for smaller industrial firms in Clark County, Washington, and thus aid continued economic development. (Also see Section II.B.)

C. Location and General Description of the Project Site

The project site consists of 140 acres located in the southeastern corner of the City of Washougal, Washington (see Figures 1 and 2). Washougal is a small, riverfront community in the northeastern corner of the Portland, Oregon, metropolitan area.

As shown in Figure 3, the site is located southeast of the current Port of Camas-Washougal Industrial Park. The site itself is bounded on the south by a dike constructed by the U.S. Army Corps of Engineers, and on the north generally by lowlands and wetlands associated with the former Steigerwald Lake. To the east is farmland used primarily for grazing beef cattle.

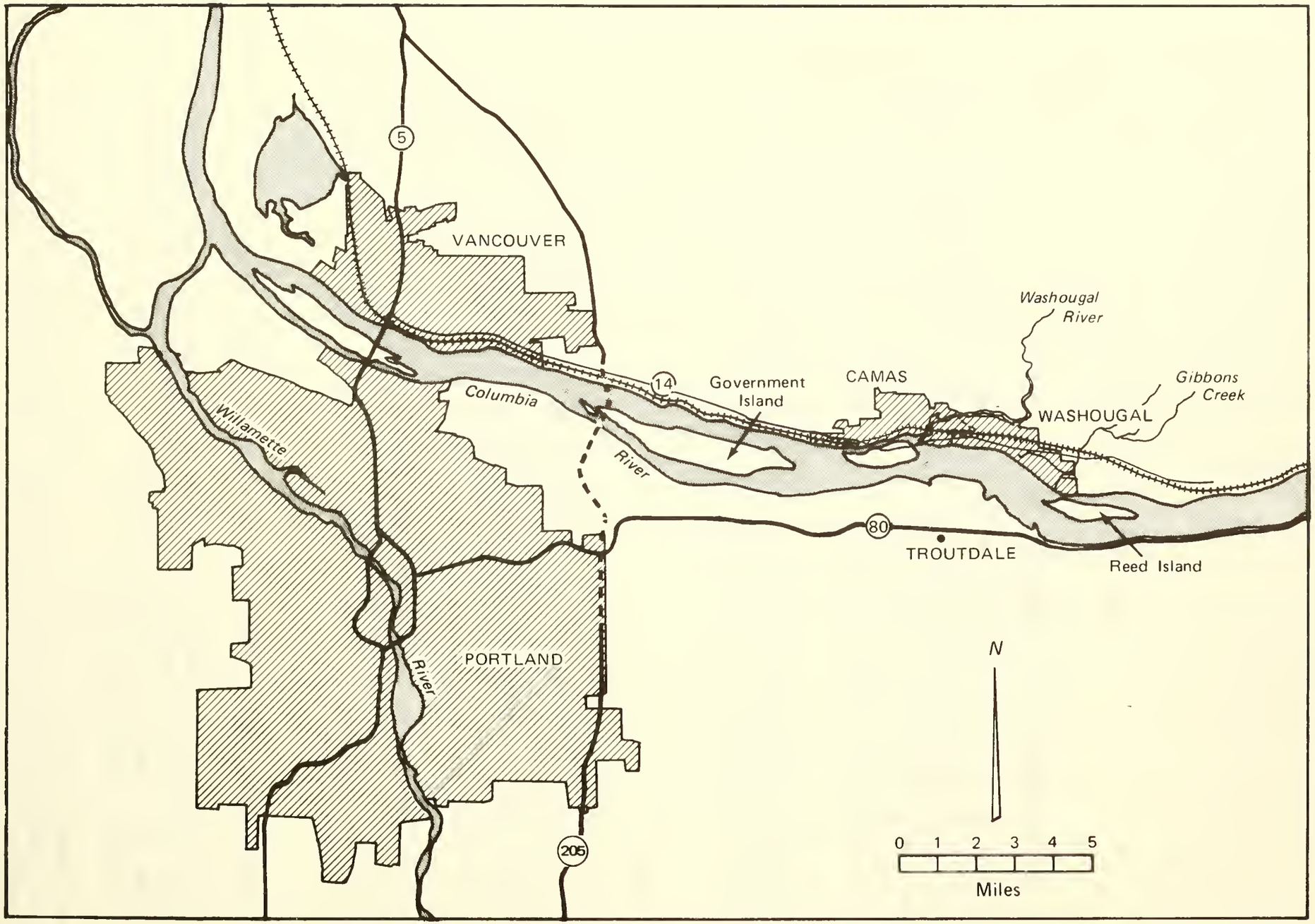

FIGURE 1. CAMAS, WASHOUGAL, AND THE REGION

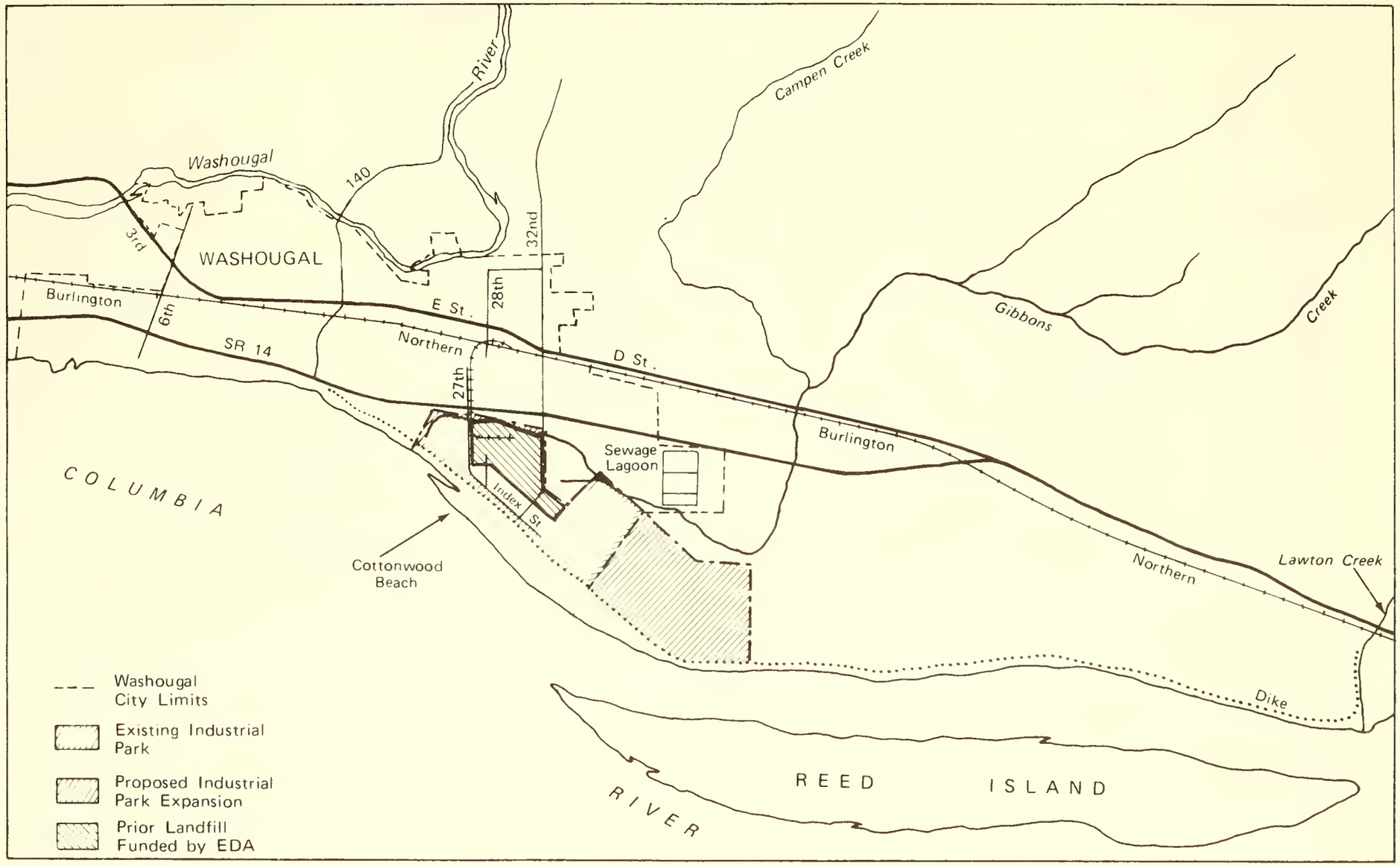

FIGURE 2. WASHOUGAL AND THE PROJECT AREA

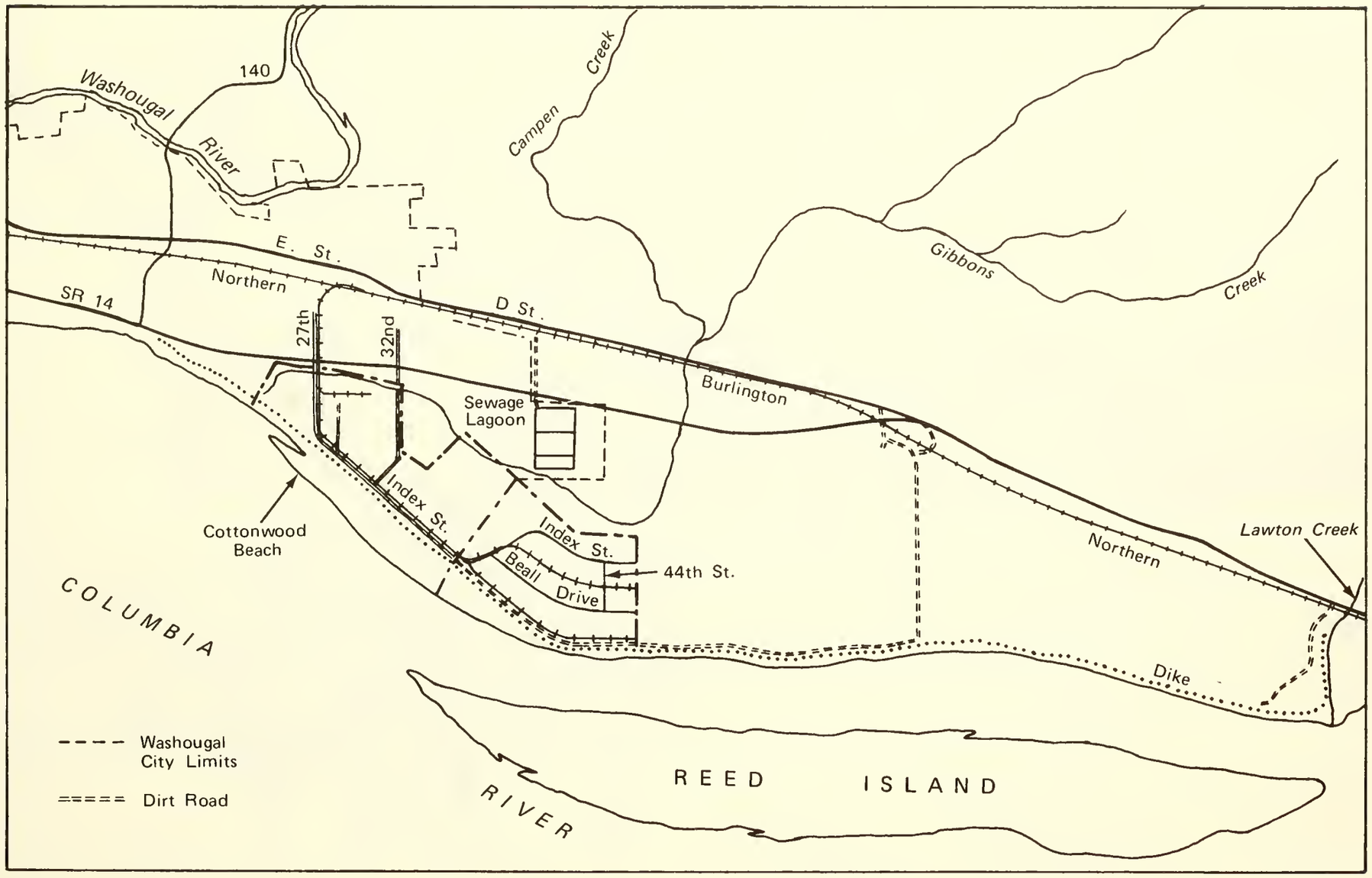

FIGURE 3. PROJECT SITE AND VICINITY

The 140-acre project site is part of a larger unit of land defined by the dike on the south and State Route 14 (SR 14) on the north (see Figure 3). The dike also forms a boundary on the eastern edge, where it turns to parallel Lawton Creek. This unit, which will be referred to in this document as the project area, contains approximately 1,500 acres.

D. Chronology and Current Status

Expansion of the Port of Camas-Washougal Industrial Park was first proposed in 1976. Table 1 lists important events that followed.

Land acquired by the Port in 1968, 1969, and 1973 was used in part to accommodate the existing industrial park. However, 63 acres of the acquired land were not used, and later figured in the transactions for the 140-acre project site. In June and July 1976, five transactions were made that involved sale of the 63 acres and outright purchase of or option to purchase various parcels that constitute the 140 acres. The Port purchased a total of 50 acres outright and concluded an option to purchase agreement on the remaining 90 acres. The Port has since exercised two options of 10 acres each.

Parametrix, Inc., the consulting engineering firm for the Port, completed a Draft Environmental Impact Statement (EIS) for the proposed project in September 1976. The Final EIS, incorporating responses to all agency comments, was published in December 1976.* Under EDA funding, Parametrix also prepared a feasibility study and environmental impact assessment of alternative methods of modifying the drainage system in the project area to restore flood protection to the level provided at the time the dike was constructed.

The proposed industrial park expansion was listed as the highest priority public works project for EDA funding in both 1976 and 1977 by the Overall Economic Development Plan (OEDP) Subcommittee of the Clark County Regional Planning Council (RPC). The project was given District and A-95 clearinghouse approval in 1976 and 1977, respectively, as well.

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*EDA concluded that it had to prepare its own EIS because this document, which was written to satisfy the requirements of the Washington State Environmental Policy Act, did not satisfy the requirements established by the National Environmental Policy Act and its implementing guidelines. Also, Executive Order 11988 and 11990, issued after the Parametrix EIS was completed (May 24, 1977), directed federal agencies to take certain steps to manage floodplain development and protect wetlands. Finally, EDA did not participate in the definition of the scope of the impact analysis or in the public meetings concerning the EIS.

Table 1

CHRONOLOGY OF THE PROPOSED PORT OF CAMAS-WASHOUGAL INDUSTRIAL PARK EXPANSION

OEDP Committee approval	June 1976
Real estate transactions to acquire project site	June, July 1976
Draft EIS prepared	September 1976
Application for EAA funds	September 1976
Application for LPW funds (Round 1)	October 1976
Preliminary engineering report	October 1976
RPC clearinghouse approval	October 1976
EAA application approved	November 1976
LPW application (Round 1) denied	November 1976
Final EIS prepared	December 1976
EDA-funded study of Gibbons Creek drainage	January 1977
Application for Section 304 funds	April 1977
OEDP Subcommittee and RPC Executive Committee approvals	June 1977
Revised preliminary engineering report	June 1977
Application for LPW funds (Round 2)	July 1977
RPC clearinghouse approval	August 1977
LPW application approved	October 1977
EDA decision to prepare EIS	November 1977
Boundary Review Board approval of annexation of project site	March 1978

Key: EAA: Economic Assistance Authority
EDA: Economic Development Administration
EIS: Environmental Impact Statement
LPW: Local Public Works
OEDP: Overall Economic Development Program
RPC: Regional Planning Council

Sources: References 1 through 12.

Financial assistance for the proposed project was first sought from the Washington Economic Assistance Authority (EAA) in September 1976. The $500,000 application was approved in November 1976. Of this amount, $125,000 will be an EAA grant; $375,000 will be an EAA loan using funds provided by EDA through its "304" program (see Section I.F.). Application to EDA for 304 support was made in April 1977, and remains pending.

Application to EDA for funds under the Local Public Works (LPW) grant program was made in October 1976. However, because EDA gave low priority to port districts, the proposed project was not funded. Subsequently, the evaluation criteria were changed in Round 2 of the LPW program. A second application was made in July 1977, and approved in October 1977.

Currently, the EAA grant and the LPW grant (from EDA) have been offered to, and accepted by, the Port. However, the latter award was made contingent on the award of state monies; the loan portion of that award, in turn, is awaiting EDA action on the 304 application. EDA cannot act until this EIS is completed and reviewed.

The revised preliminary engineering report for the proposed project was completed in June 1977. The preparation of detailed plans and specifications is now virtually complete. If the Port's 304 application is approved, at least 30 days will be required to complete detailed plans and specifications, including modifications to mitigate impacts of the project. Bids for construction will then be solicited.

E. Development Plan

1. Activities[11]

Expansion of the industrial park will involve two principal activities: (1) grading, and extending utilities and transportation facilities; and (2) preparing specific parcels for occupancy. The project site is relatively level, so only minor grading will be necessary for drainage control and for road and railway placement; fill from off the site will not be needed. Utilities and road and rail access now generally terminate within the existing industrial park. Initially, therefore, utilities must be brought to the site and basic road and rail access provided. Distribution lines and additional streets will be installed as individual parcels are developed.

a. Utilities and Transportation Facilities

Road access will be provided by connecting to the present road at 32nd and Index Streets. Approximately 8,500 feet of road will be required. The street system will provide access to all areas of the site, allow for the construction of additional streets to smaller parcels divided in the future, and permit future extension to land beyond the 140-acre site. Initially, the roads will have two traffic lanes,

but they will be on 84-foot rights-of-way that will accommodate future expansion to four lanes. Initial construction will consist of two 12-foot lanes with 8-foot gravel shoulders and drainage provisions. Addition of curbs and sidewalks will be considered at the time of widening. Minimal subgrade excavation is anticipated. Initially, because the design traffic volume will not be reached for a considerable period, only a portion of the design thickness of the asphalt-concrete road surface will be laid. The final two or three inches will be overlaid when traffic warrants the strength of the full design thickness.

Rail access will be provided by connecting new track to the existing rail line, which terminates at the southwestern corner of the Bonneville Power Administration (BPA) property, near the intersection of 32nd and Index Streets (see Figure 3). Approximately 7,000 feet of track will be required. Road crossings will be at grade with flangeway crossing guards.

Water will be provided by connecting to the existing 14-inch line at 32nd and Index Streets. Approximately 3,100 feet of 14-inch line will be installed along Index Street to bring water to the site, and 5,900 feet of 10-inch line will be installed along roads within the site. To complete a loop back to the existing system, 1,800 feet of 8-inch line will be installed across the BPA property. Valves and fire hydrants will be provided with the new water lines. Design of the water facilities will be based on criteria outlined in the 1975 Washougal Water System Facility Plan.

Sanitary sewer lines will be installed to collect domestic sewage from industries that locate on the project site. A pump station will be needed at the southwestern corner of the site. Approximately 6,500 feet of pipe will be required to collect wastewater and convey it to the pump station. A force main will carry the wastewater about 2,100 feet to the present sewer system. The design capacity will be sufficient for developing the project site and some future expansion.

Storm sewers will be provided to minimize flooding on the project site. Catch basins will be located along roads to collect surface runoff. A 25-year storm will be the design basis. The storm water will flow by gravity via conduits and existing drainage channels to the wetlands directly north of the project site (see Figure 3). Approximately 7,700 feet of storm sewer line and 38 catch basins will be required.

b. Industrial Parcels

The Port intends to attract relatively small, diversified, and nonpolluting industrial firms to the project site. Typically, these firms would employ less than 100 people, represent a variety of business sectors, and produce no unusual kinds or amounts of air or water pollutants or solid waste. The firms of interest generally require from 2 to 10 acres for their operations, although exceptions occur. Therefore,

the physical layout of the expansion site will be designed to accommodate the typical 2- to 10-acre firm, with provisions for both smaller and larger firms. Parcels will be defined by the shape of the site and the layout of improvements, and will be further divided into various sizes as required by each prospective industry. About 8 low-lying acres in the northwestern corner of the site will not be developed because they are part of the adjacent wetlands.

2. Schedule[11,12]

As noted in Section I.D., detailed plans and specifications must be completed before bids can be solicited. After the plans are completed, development will proceed according to the tentative schedule in Table 2. Full occupancy is projected to occur over 9 years; this projection is based on the rate at which the existing industrial park was occupied. Individual parcels will be developed as prospective occupants are identified and purchase or lease commitments are made.

3. Development Standards[13]

In March 1978, the Port adopted Standards of Development for its industrial park expansion. The stated intentions of these standards are, among other things, to:

1. Outline the level of excellence the Port expects in the development of its Industrial Park.

Table 2

PROJECTED DEVELOPMENT SCHEDULE

Action	Time Required
Complete plans and specifications	45 days
Advertise for bids	30 days
Select contractor	10 days
Extension of utilities, construction of roads, and preparation of first parcels	10 months

Sources: References 11 and 12.

2. Maximize the potential of each site at the Port's Industrial Park while minimizing natural environmental losses.

3. Structure development at the Port's Industrial Park towards a high quality continuity, while allowing freedom for innovation and creativity by each individual tenant and vendee (i.e., property owner), thus protecting the investment of tenants, vendees, and the Port.

4. Insure compliance with appropriate Federal, state and local codes, ordinances and directives.

5. Outline the required levels of maintenance performance and operation which will maintain a high quality of development over time.

6. Insure the maximum convenience, safety and identity for each tenant and vendee, plus creation of a pleasant area for people to work and relax.

7. Expand the economic base of the Camas-Washougal Port District and to maintain the highest quality of living with environmental excellence.

In addition to plan submittal, variance, and enforcement procedures, the standards document includes development, performance, and maintenance standards. Development standards are described for buildings, parking, loading, storage, utilities, signs, access, landscaping, and area lighting. Performance standards cover air pollution, noise, vibration, heat and glare, waste material, water pollution, and dangerous materials. Maintenance standards are specified for buildings, landscaped areas, paved areas, signs, lighting, and wharf and pier fronts.

The Port considers these standards to be minimum standards, and assumes that firms locating in its industrial park will wish to carry out the finest possible development in their own self-interest. The standards, are intended to protect against undesirable development and to enhance property values. They apply to all property within the 140-acre project site now owned or acquired in the future by the Port. The standards will be a contractual obligation of any lease agreement entered into by a firm with the Port. For land sold by the Port to a firm, the standards will be convenants running with the land.

F. Costs and Financing[6,8,10]

The total cost of the proposed 140-acre industrial park expansion was estimated to be $1,340,000 in the July 1977 application for an LPW grant. This cost is distributed among the principal development activities approximately as shown in Table 3. Although not estimated recently, the cost of the proposed project undoubtedly has risen.

The cost of necessary modifications to the Gibbons Creek drainage system (see Section II.D.) is not included in Table 3. In the January 1977 study of the situation, it was concluded that an additional pump should be installed at an estimated cost of $85,000.[4]

The proposed project will be financed by money from three sources:

EAA grant	$125,000
EAA loan	375,000
EDA grant	840,000
	$1,340,000

The EDA grant was applied for in Round 2 of the LPW funding program established by the Public Works and Economic Development Act of 1977 (PL 95-28). Although this grant has been awarded, execution of the award is contingent on the availability of the other funds.[9]

EAA has awarded a grant subject to approval of the companion loan application by EDA.[7] The EAA grant and loan are funding sources authorized by Section 304 of the Public Works and Economic Development Act (PL 89-136). This section authorizes supplemental funding for public works and development facilities eligible for grants and loans under certain other titles of the act. The state in which the project is located must contribute at least 25% of the grant or loan amount. EAA has structured its use of 304 funds as loans to maintain a revolving assistance fund.

Table 3

COSTS OF PRINCIPAL DEVELOPMENT ACTIVITIES

Roads	$ 320,000
Railroad	425,000
Water system	200,000
Sanitary sewers	210,000
Storm drains	150,000
Site grading	35,000
Total	$1,340,000

Source: Derived from Reference 11

II PURPOSE OF PROJECT

A. Need for Project

Expansion of the Port of Camas-Washougal Industrial Park will provide a general economic stimulus to the area. In 1970, some 30% of the families in Camas and 45% of the families in Washougal earned less than 80% ($8,156) of the median income of $10,195 in Clark County.[14] In addition, the area relies heavily on two major employers, the Crown Zellerbach paper mill and Pendleton Woolen Mills. Crown Zellerbach employs about 2,500 workers, and Pendleton more than 400, a total greater than the combined Camas-Washougal labor force. Thus, the local consequences of a substantial layoff or strike would be severe. At present, about 15% of the Camas-Washougal labor force commutes to Portland.[15] In short, more diversified local job opportunities offered by an expanded industrial park would be desirable.

Officials of the Port, the county, and the state have noted a strong demand for industrial space in Clark County. The project area is the only land available for industrial development in the southeastern part of the county. Consequently, the Port is confident that there will be no difficulty in filling the expanded industrial park.

B. Objectives

The principal objective is to foster economic development by increasing industrial employment and diversifying the local economic base. The proposed expansion will provide continuing construction employment over the 9-year development period, and more than 1,000 new, permanent, industrial jobs for the community (see Section V.D.1). It is expected that 24% or more of the total jobs will be held by women and ethnic minorities; this percentage of these groups is currently employed in the Port's industrial park.[6]

The land prepared in this project will be occupied by a mix of light- and medium-scale industries offering a range of job opportunities from managerial to skilled and unskilled positions. Light-scale industries are manufacturers. Medium-scale industries include primarily large scale fabricators, primary metals, and lumber.[13]

Thus, the expansion will add substantially to the economic health and stability of the community by offering more and varied employment opportunities and providing a stronger base for continued economic

growth. New industries also will stimulate increased demand for local goods and services and provide a larger tax base for local government.

C. Expected Results

1. Economic Gains

Expansion of the Port of Camas-Washougal Industrial Park will create new and diversified local employment opportunities, which will reduce the dependence of the local economy on the two current major employers, Crown Zellerbach and Pendleton Woolen Mills. Perhaps 24% of the more than 1,000 jobs that will be created over 9 years will be filled by women and ethnic minorities. New industrial firms will increase demand for local goods and services and increase government tax revenues. The expected gains are discussed at length in Section V.D.1.

2. Population Change

There are no residences on the project site, and residential use is not contemplated. Thus, future onsite population will consist of nonresident employees. However, increases in residential population will be induced in the surrounding community. The total residential population associated with the new employment is estimated to be 5,700 (see Section V.D.2.). But because current residents will probably take some of the new jobs, the actual increase in population is expected to be less than 5,700.

3. Land Use Changes

Currently, land in the project area is used for agriculture (pasture and some crops); hunting is allowed by permission of the landowners. The project site, which is currently a hayfield, will be converted almost entirely from open space to industrial use. Only an 8-acre portion will be left in its present state.

Development of the project site will probably accelerate industrial development of parcels in the adjoining project area. Furthermore, land in other parts of the county and city will be more rapidly converted to residential and commercial uses to accommodate the new employees and their families.

D. Related Activities

A number of other projects are planned or under way in the vicinity of the project site. They are related to the proposed project in various ways, most frequently because of their proximity. The location of the activities outlined in the following paragraphs can be seen by referring to Figures 1 through 4.

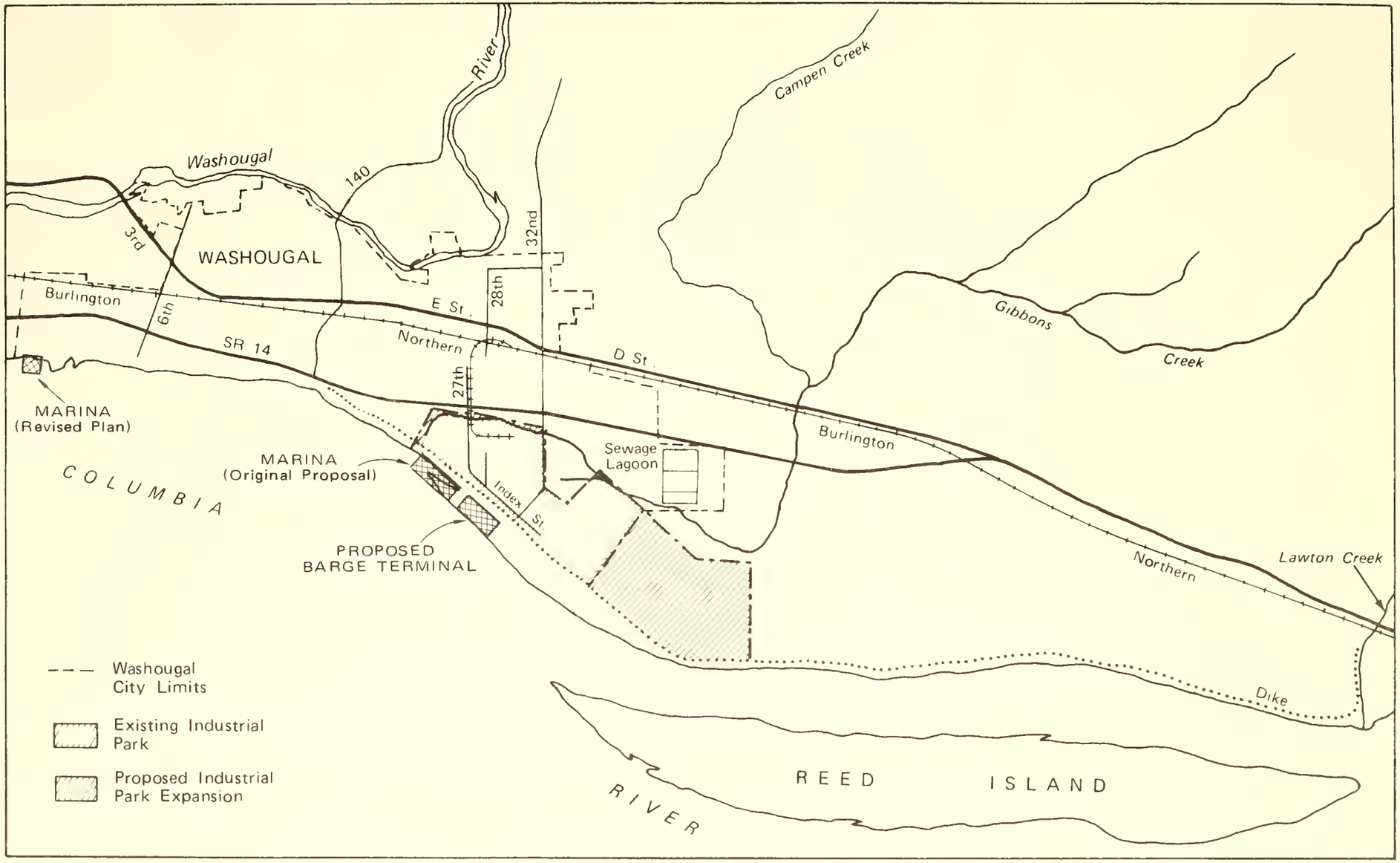


FIGURE 4. LOCATIONS OF RELATED ACTIVITIES

The Port of Camas-Washougal plans to construct a barge terminal on the Columbia River just west of Cottonwood Beach. A permit application submitted to the U.S. Army Corps of Engineers is now undergoing review. Parametrix, Inc. has prepared an Environmental Impact Statement (EIS).[16] Materials dredged to construct the barge terminal will be used to enhance the Cottonwood Beach area. Some dredged material might be temporarily stockpiled or disposed of by using it as fill on the project site. However, the need to do this has not been established, nor have plans been made to do so.

The economic feasibility of the proposed barge terminal has not yet been analyzed.[2] However, the terminal and the expanding industrial park clearly will have a mutually beneficial relationship. If the barge terminal is approved, some firms will be attracted to the industrial park by the prospect of convenient, relatively inexpensive water transportation. Conversely, the apparently strong interest expressed in the expanded industrial park will help make the barge terminal economically feasible.

Just downriver of the barge terminal, the Port had also wished to build a marina to accommodate approximately 500 small pleasure craft. In fact, both the barge terminal and marina were part of the original application to the Corps. But, apparently for both economic and environmental reasons, the plans for a marina adjacent to the barge terminal were dropped. Instead, the existing Port marina at Parker's Landing will be expanded.

The sewage treatment lagoon for the City of Washougal is located along SR 14 just north of the existing industrial park. It discharges into the lower, channelized reach of Gibbons Creek, which is adjacent to the project site. The U.S. Environmental Protection Agency is funding a project to improve the level of treatment from primary to secondary.

I-205, the East Portland Freeway, is under construction east of the Portland-Vancouver metropolitan area. This 36-mile interstate highway passes through parts of Multnomah County and the City of Portland in Oregon, and Clark County in Washington.[17] It is complete except for a 9.2-mile segment from SR 14 east of Vancouver to S.E. Foster Road in Portland. The major feature of this last segment will be two parallel bridges across the Columbia River with four lanes of traffic in each direction and a bikeway in the median. This highway is expected to make commuting between the Portland area and the Camas-Washougal area easier. Thus, current Portland area residents may be attracted to jobs in the Camas-Washougal area, and vice versa. The improved access will also make Camas-Washougal more attractive to industries looking for new plant locations.

III DESCRIPTION OF THE PROJECT SITE AND REGION

A. History

1. The Camas-Washougal Area[18]

In the 18th Century, the Camas-Washougal area was populated by Chinook Indians, who fished for salmon and sturgeon and harvested camas and wappato roots. Camas (originally LaCamas) was named for the blue lily whose roots were harvested; Washougal is variously translated as "rushing waters" and "land of plenty."

In October 1792, a party of seamen led by Lt. William R. Broughton of His Majesty's Navy were the first white men to explore upstream from the mouth of the Columbia River. They explored at least as far as Reed Island, and landed at Cottonwood Beach. On their overland expedition, Lewis and Clark camped in the Washougal area in 1806 to gather food and game before continuing their journey. In 1838, Americans became the first white men to live in the area. In 1845, David C. Parker established the first formal homestead in the area (now known as Parker's Landing), and built a dock to receive supplies and accommodate river boats. Gibbons Creek was named for Joseph Gibbons, who settled in the area in 1847, a year after the 1846 treaty made the Washington Territory part of the United States. Washougal was founded in 1880 by Joseph E. C. Durgan, and incorporated in 1908.

The economy of the area was and still is based largely on logging, lumbering, dairying, livestock, and general farming. Industry was introduced in 1883 when the Columbia River Paper Company, a predecessor of the Crown Willamette Paper Company, built a water flume at LaCamas. This was the beginning of the first paper mill in the Washington Territory. Crown Zellerbach was born in 1928 when the Crown Willamette Paper Company merged with the Zellerbach Company. The second major industry, a woolen mill, was established around the turn of the century. In 1953, the Washougal Woolen Mill merged with Pendleton Woolen Mills.

In the mid-1800s the Columbia River was virtually the only means of access; only trails connected the Camas-Washougal area with Vancouver. A major factor in the area's industrial growth was the development of easy freight transportation. The first wharf in Washougal was constructed in 1880, and before 1900, boats carrying both passengers and freight were making daily round trips between Portland and Washougal. By 1909, the Spokane, Portland and Seattle Railway was running two daily trains through Camas.

2. The Project Area

The project area was part of the Columbia River floodplain until a dike was built by the Corps of Engineers in 1966. Before then, land use and development were restricted because of frequent flooding. Industrial development was limited to the Pendleton Woolen Mills plant. Agriculture occupied about one-half of the (flood control) project area; the remaining half consisted of Steigerwald Lake and its adjacent wetlands. Flooding occurred yearly during the spring thaw; major floods were recorded in 1894, 1916, 1948, and 1956.[19]

Construction of the dike was authorized by the Flood Control Act of 1950 as part of the comprehensive flood control plan for the Columbia River Basin. At first intended to protect against a recurrence of the very high 1894 flood, the dike design was revised as impractical from both engineering and economic standpoints.[19]

When the dike was completed in 1966, it was intended that Steigerwald Lake be maintained at a normal elevation of 8 feet above Mean Sea Level (MSL). Runoff from Gibbons Creek and the local area was to be accommodated by allowing water to pond to elevation 13 feet MSL.[19] Subsequent landfilling, however, has decreased the storage area.[4] Further, much of the vegetation has been cleared and burned, and Steigerwald Lake drained, although some of the area has maintained wetland characteristics.

The Port of Camas-Washougal was formed in 1935. In 1968, the Port constructed a moorage facility at Parker's Landing and in 1970, it built a sizable public warehouse, which it later sold to a local firm. Until 1970, the port district consisted mainly of a dock and a warehouse serving local firms, particularly Pendleton Woolen Mills and Crown Zellerbach. Flooding was a constant problem for the Port's warehouse until the dike was constructed.[18]

Land for the first portion of the existing industrial park was purchased in 1961,[1] and active development began in 1965. Part of the original 101-acre development was made possible through a prior EDA Public Works grant and state EAA loan.[9] In 1970, the Port issued $1 million in revenue bonds to continue development of the existing industrial park.[18] By mid-1978, the existing park was fully occupied by 16 firms.

Events related specifically to the site of the proposed expansion are described in Section I.D.

B. Physical Resources

1. Land

a. Physiography[20]

The landscape in the vicinity of the project area is extremely diverse. The project area is located in a large, north-south valley known as the Willamette-Puget Trough, between the Pacific Coast Ranges to the west and the Cascade Range to the east. It is set in a region of high, old alluvial terraces against the volcanic foothills and mountains of the western slopes of the Cascade Range. The nearby foothills are characterized by steep slopes and mature drainage with elevations as high as 3,000 feet (see Figure 5). Volcanic rock predominates. The foothills change abruptly to the alluvial plains, where the slope becomes gentle, and there is a change to unconsolidated and semi-consolidated sedimentary rocks. The headwaters of the three creeks in and near the project area (Gibbons, Campen, and Lawton Creeks) are found along a lowlying ridge of volcanic rock outcropping within the surrounding sedimentary units. However, most of their watersheds lies within the Troutdale Bench, which is the highest of the alluvial plains. The Troutdale Bench is generally separated from the lower plains by a scarp 100 to 200 feet high. The slopes along upper Gibbons, Campen, and Lawton Creeks are densely vegetated and very steep, with grades ranging from 30 to 55%.

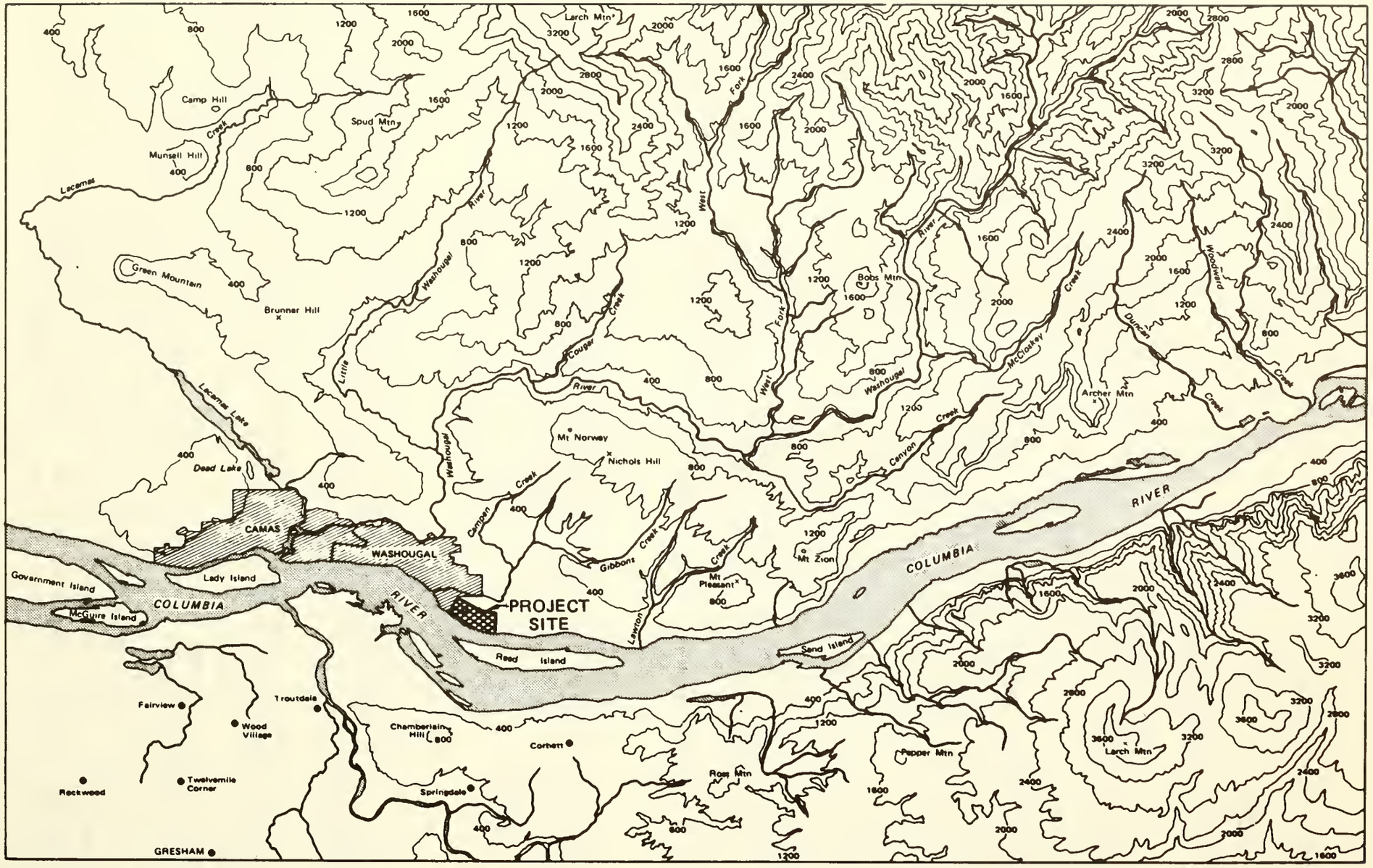
The proposed project site is relatively flat. Elevations are generally between 20 and 25 feet MSL,[3] except for the northwestern corner of the site and a natural drain within it, which lie below the 20-foot contour.

b. Climate[20]

The tempering influence of the ocean gives the Camas-Washougal area a mild climate characterized by relatively warm, wet winters and moderately warm, dry summers.

Low-pressure frontal storms moving east from the Pacific Ocean along a fairly well-defined path bring much of the precipitation to Clark County. Approximately 75% of the precipitation occurs during the 6-month period from October 1 to March 31, and most of that in November through January. Only 3% falls during July and August. Records at the nearest climatological recording station (Troutdale, Oregon) indicate that annual precipitation averages between 40 and 60 inches per year. The maximum 24-hour rainfall recorded at Portland International Airport was 2.6 inches. Storms of several days duration with up to 1 inch of rain per day are not uncommon.[79]

Average annual precipitation increases at locations closer to the Cascade Mountains (i.e., as elevation increases). For example, one hydraulic study showed that Camas averaged 47 inches, while



SOURCE: U.S. Geological Survey, 15 Minute Quadrangles

FIGURE 5. TOPOGRAPHY IN THE VICINITY OF THE PROJECT AREA

Washougal averaged 50 inches, and the upper watershed of the Little Washougal River, more than 65 inches. Most of the precipitation is rain, although snow and sleet do fall during the winter months.

c. Geology[20]

Rocks in the vicinity of the project area range from consolidated rocks of chiefly volcanic origin in the foothills to alluvial deposits on the floodplain of the Columbia River (see Figure 6). The older, consolidated rocks are composed of lava, with the possibility of some associated interbedded sedimentary rocks. Overlying these rocks are the semi-consolidated silt, sand, and gravel of the Troutdale formation. Lava extrudes through the Troutdale formation in some areas and commonly forms the high points within the otherwise gently sloping alluvial plains. Northeast of Washougal, for example, the Washougal River follows a lava outcropping and abruptly turns south when the lava outcropping disappears beneath the surface (see Figure 6). The remaining area is covered by alluvial deposits of sand and gravel.

Much of the present character of the land was determined 1.8 million to 10,000 years ago. During this period, the Columbia River cut a broad valley in the Troutdale formation somewhat deeper than the present valley. Late in this period, the river began to build a great delta or fan downstream from the mouth of the Columbia gorge near Washougal, filling the valley with coarse sand and gravel. The delta built up to an elevation of 350 feet. In the last 10,000 years, the river eroded the delta, and eventually returned to its former channel.

d. Soils[21]

The project area is composed entirely of poorly drained soils (Sauvie series) formed in recent Columbia River alluvium. Lower elevations are subject to flooding during the winter months, and small bodies of standing water are common throughout the year. The soil has moderate shrink-swell potential which, in conjunction with periodic flooding, can create significant foundation problems. Although the soil is fairly sandy, drainage is poor because of water percolating through the ground from the Columbia River and because the groundwater table is often near or above the surface.

The soil in the project area is excellent for several types of land use. It has high fertility and is productive, although conservation practices are needed to control erosion. The soil is commonly used for pasture and is excellent for grain crops if adequately drained. The soil is rated excellent for farmland and wetland wildlife such as Chinese pheasant, California quail, ducks, geese, and kildeer.

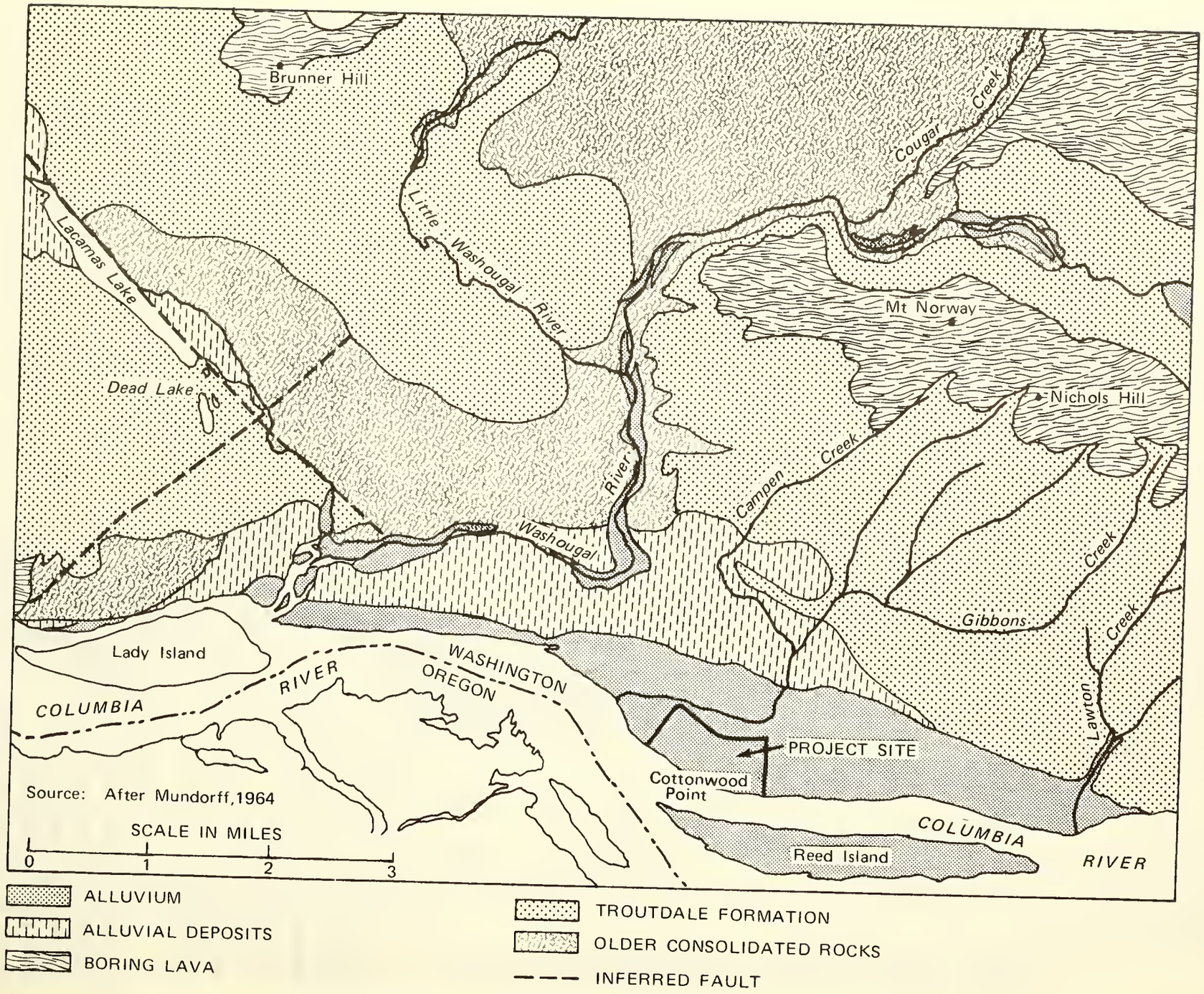


FIGURE 6. GEOLOGIC MAP OF THE VICINITY OF THE PROJECT AREA

e. Geologic Hazards

Several geologic hazards in the Camas-Washougal area have been identified. In particular, the steep, upper watersheds of Campen, Gibbons, and Lawton Creeks have the potential for landslides, especially when soils are saturated with water. The project site itself has the potential for foundation-settling.[22] Other problems associated with seasonal flooding of the Steigerwald Lake area are discussed in Section III.B.2.

The Seismic Risk Map of the United States places the project area in Zone 2, the zone in which moderate damage from earthquakes can be expected. Although several major earthquakes have occurred in Puget Sound (Risk Zone 3: major destructive earthquakes may occur), none have been recorded in the immediate area of Camas and Washougal.[80]

A normal fault trending southeast along the eastern edge of Lacamas Lake (see Figure 6) has been identified, as have slickenslides (polished rock indicating rock masses that have slid past one another) and sheared zones along the southern portion of Lacamas Creek.[20] The fault apparently has raised the older consolidated rocks relative to the Troutdale formation. Recent movement along the fault has not been observed, but volcanic activity or other seismic activity might reactivate it.

f. Mineral Resources

The primary minerals produced in Clark County in 1974 by order of value were stone, sand and gravel, and clays. The combined value of production for these three commodities represented less than 4% of total state production.[81] Two locations are currently being mined near the project area: the Fisher Quarry, approximately 4 miles west of Camas, and a borrow pit 1.5 miles northeast of the project site in the Gibbons Creek watershed.

Good-quality sand and gravel deposits are often in great demand for construction. In Clark County, the Troutdale formation provides the best source of such materials.[22] But as shown in Figure 6, this rock unit does not outcrop in the project area; the project site is composed entirely of alluvial deposits of clay, silt, sand, and gravel.

2. Water

a. Surface Water

The Columbia River is the major surface water feature in the project area and in the Pacific Northwest. River flow is substantial but varies widely because the watershed does not store much of the rainfall in tributaries or upland areas before it enters the main stream. Measured flow at Bonneville Dam has ranged from about 600,000 cubic feet

per second (cfs) to as low as 35,000 cfs -- about a factor of 20 difference.[16]

Water quality in the Columbia River is rated "A" (Excellent) by the Washington Department of Ecology to well above the project site.[24] The river is low in total dissolved solids, suspended solids, and turbidity, and high in dissolved oxygen.[23]

Gibbons Creek drains approximately 8.5 square miles of hilly terrain and primarily semi-consolidated sandy sediments. Another four square miles of former Columbia River floodplain (the Steigerwald Lake area) also drain into lower Gibbons Creek. The Gibbons Creek watershed (including Campen Creek) has not been gaged by the U.S. Geological Survey, but based on estimates of the watershed area and average annual precipitation, the mean annual flow has been estimated to be less than 20 cfs.[19]

The dike built by the Corps of Engineers has a top elevation of 43 feet MSL and protects the area behind it from a 100-year flood of the Columbia River. It also eliminated the natural outlet of the Gibbons Creek and Steigerwald Lake drainage basin to the Columbia River. To compensate, an artificial drainage system was constructed. Water now flows through 5,500 feet of dredged canal to a pumping station and tide gate, which discharge the water into the Columbia River.[19]

The design of the drainage system assumed that Steigerwald Lake would be maintained normally at 8 feet MSL, and that the volume between 8 and 13 feet MSL would be used to store runoff in excess of the installed pumping capacity during periods of heavy rainfall. The storage and pumping capacities were based on a 20-year storm in the Gibbons Creek watershed. The land between the 13 and 14-foot contours was to be kept unobstructed as a contingency margin. As the sponsoring agency, the Port agreed to maintain and operate the drainage system.[19] Although drainage facilities have been constructed in the eastern part of the project area, flooding has occurred there above the 14-foot contour during periods of heavy or prolonged precipitation. This flooding is evidently due to inadequate drainage ditches and canals, rather than to exceeding the storage capacity below the 14-foot contour.[4]

Since 1966, landfilling within the 14-foot contour has reduced the storage capacity between the 8 and 14-foot contours. A severe rainstorm would now probably cause flooding runoff waters to rise above the 14-foot contour. The lost storage must be compensated for by increasing the pumping capacity or diverting some or all of the runoff directly to the Columbia River. A recent study (funded by EDA) recommended that (1) no further land filling that would decrease storage volume should be allowed unless either water inflow is decreased or pumping capacity is increased, (2) an additional 20,000 gpm pumping capacity should be installed, and (3) further study of the benefits of modifying the dike system to return Gibbons Creek to its original condition of flowing directly into the Columbia River be carried out.[4]

Just north of Gibbons Creek, at the western end of the former Steigerwald Lake area, lies the Washougal sewage treatment facility. Effluent from this plant flows into the Gibbons Creek canal and has caused water quality problems (high biological oxygen demand and low dissolved oxygen) during low flow periods. However, above SR 14, Gibbons Creek is rated "A" (Excellent) in water quality.[24]

b. Groundwater[25]

Groundwater is plentiful in the vicinity of the project area, and provides most of the water supply in the Camas-Washougal area. Specific capacities for wells in the area are very high, ranging up to 500 gpm per foot of drawdown. At Washougal, coarse sand and gravel deposited as a fan by the Washougal River serve as an excellent aquifer.[20] The groundwater supply wells for the City of Washougal probably tap these deposits. Recharge is by precipitation and by seepage from Gibbons, Campen, and Lawton Creeks and the Washougal and Columbia Rivers. The quality of the groundwater is excellent.

c. Wetlands

Before the dike was built, the project area was periodically inundated by both the Columbia River and Gibbons Creek. Steigerwald Lake, though permanent, varied considerably in size, and during the dry months would shrink to its smallest extent, surrounded by marshes. Following construction of the dike, progressively more and more land was reclaimed for agricultural use. Draining of land, channelizing of lower Gibbons Creek, and operation of pumps have resulted in the destruction of Steigerwald Lake as a year-round body of water. Runoff from the Gibbons Creek watershed, precipitation, and groundwater are now the significant hydraulic influences on the project area. Consequently, only remnants of Steigerwald Lake remain. In addition to year-round saturated soils near Gibbons Creek, which vary with runoff and precipitation in the watershed, additional saturated soils and intermittent ponds appear during winter and spring as well as after heavy precipitation. These remnants exist or appear in the areas of lowest elevation.

The current extent of wetlands in the project area has not been determined. To do so would require a careful survey which would use the following definition or its equivalent:

> The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, river overflows, mud flats, and natural ponds.[26]

It is clear that a significant portion of the project area could qualify as wetlands on the basis of vegetal and hydrologic characteristics. This includes the northwestern corner of the project site and a low natural drain that extends roughly from the center of the site to the northwestern corner. At the least, the area of usually saturated soil west of the sewage lagoon along the Gibbons Creek canal (about 65 acres) and other permanently or seasonally saturated areas qualify. How far east the wetlands extend is uncertain. In the western portion of the project area, the existing wetlands lie below the 14-foot contour. The eastern portion of the area appears drier, so the existing wetlands probably do not exceed the 14-foot contour. Therefore, the maximum extent of the existing wetlands is less than the area defined by the 14-foot contour, which amounts to about 420 acres. Historically, much of the project area was subject to periodic flooding, and wetlands were found at elevations above 14 feet. Therefore, because restoration might be possible, the area of potential wetlands is considerably larger than the area of existing wetlands.

When the Steigerwald Lake area was diked in 1966, the ecosystem was significantly altered. Drainage was improved, reducing the amount of wetland vegetation. Flooding by the Columbia River was prevented, thus eliminating periodic flushing and sediment deposition and erosion of the area. Currently, the area is subject to periodic flooding from Gibbons Creek during the wet season (from October to March). Standing water in certain areas is common, caused by poor drainage and by the artesian pressure developed by Columbia River water percolating through sand lenses in the underlying alluvial material.[82] The lowest elevation of the groundwater in the project area is the surface of Gibbons Creek. The usual groundwater level in the area is 8 feet MSL.[4]

No information is available concerning the load of suspended solids entering the wetlands from the Gibbons Creek watershed. The potential for erosion is severe in the soils on the footslope and midslope along Gibbons, Campen, and Lawton Creeks.[21] Denudation of the vegetation on any of these slopes for home construction or road building would cause erosion that could lead to severe gullying and a significant increase in the volume of sediment entering the Steigerwald Lake wetlands. Increased sedimentation would fill the lower elevations of the lake, further reducing the extent of wetland vegetation and raising the maximum elevation of potential floodwaters within the dike (assuming no change in pumping capacity).

3. Air

a. Meteorological Features

Washougal is situated within the Portland-Vancouver metropolitan area, at the confluence of the Columbia and Willamette Rivers. The area is part of a basin extending west and north along the Columbia River where it emerges from the Columbia Gorge, and south along the

Willamette Valley. The prevailing winds are from the northwest during April through September and from the east-southeast during October through March.[14] Air also flows across the Columbia in both directions, transferring air pollutants between southern Clark County (in which Washougal is located) and Portland.

b. Air Pollution Control Authority

Washougal is in the Portland Air Quality Control Region (AQCR #193). This federally-defined interstate AQCR covers southwestern Washington and all but the coastal area of northeastern Oregon, including the Willamette Valley.

Washougal is within the jurisdiction of the Southwest Air Pollution Control Authority (SWAPCA), a regional agency which covers the counties of southwestern Washington (Clark, Cowlitz, Lewis, Skamania, and Wahkiakum). SWAPCA controls stationary sources other than kraft pulping processes and aluminum reduction, which are reserved for the Washington Department of Ecology (DOE). Authority over mobile sources is also reserved for the state, but there is no DOE requirement for review of complex sources (i.e., traffic).[27]

An Oregon-Washington Air Quality Committee reviews proposed projects along the boundary between the two states. In the event of disagreements within the committee, the U.S. Environmental Protection Agency (EPA) has the authority to arbitrate.

c. Pollutant Emissions

The principal stationary sources of air pollutant emissions in the Camas-Washougal area are the Crown Zellerbach pulp and paper mill in Camas, and the Reynolds Aluminum plant and Troutdale airport across the Columbia River in Oregon. Westerly winds bring noticeable odor from the Crown Zellerbach mill to the project area.[3] Emissions from stationary sources in the area are listed in Table 4. The state inventory includes the Crown Zellerbach plants in Camas, and the High Cascade sawmill and dry kiln in Washougal. The total emissions were obtained by adding estimates of the emissions from the existing industrial park to the state inventory, considering the number of sources and their approximate emissions with the required controls. Emissions in the complete Portland AQCR are listed in Table 5.

d. Air Quality and Standards

The Portland-Vancouver metropolitan area (consisting of Clackamas, Multnomah, and Washington Counties in Oregon, and Clark County in Washington) has been designated a federal Air Quality Maintenance Area (AQMA) for particulates, SO_2, CO, and NO_x.[29] This designation means that due to current pollution levels or expected

Table 4

AIR POLLUTANT EMISSIONS FROM STATIONARY SOURCES IN THE CAMAS-WASHOUGAL AREA

	Emissions (tons per year)				
	Particulates	SO_2	NO_x	HC	CO
State emissions inventory	1,613	1,978	1,327	111	3,985
Total Camas-Washougal emissions, including the existing industrial park	1,650	2,000	1,330	120	3,990

Sources: References 27 and 28.

Table 5

AIR POLLUTANT EMISSIONS PORTLAND AQCR, 1976

	Tons per Year
Carbon monoxide (CO)[a]	935,600
Oxides of nitrogen (NO_x)[a]	93,600
Sulfur oxides (SO_2)	30,500
Particulates	49,100

[a] CO, NO_x, and HC (not listed) are principally from motor vehicles.

Source: Reference 29.

increases in emissions due to growth, air pollutant emission control plans are required to avoid exceeding air quality standards.

The Oregon portion of the Portland-Vancouver AQMA has been designated a nonattainment area for particulates, CO, and NO_x because ambient levels of these pollutants exceed federal standards.[30] EPA has designated the Vancouver urban area in southern Clark County as a nonattainment area for NO_x.[31] Control strategies for nonattainment areas must be developed by January 1979, and no major stationary sources of air pollution may be built or expanded in these areas unless an EPA-approved control plan (or an approved transportation control strategy plan and schedule) is adopted by July 1, 1979. The work now underway to develop the required control strategies and plan is being coordinated by the Oregon Department of Environmental Quality .

State and federal ambient air quality standards are shown in Table 6. Air quality measured at stations in Camas and Vancouver (the Washington stations closest to Washougal) are shown in Table 7. The particulate readings in Camas are close to the standards, but the standards are exceeded at some Vancouver stations. SO_2 readings are below the standards, although close in the case of the annual average. CO at the Vancouver station is very close to the 8-hour standard. Photochemical oxidants exceed the standard at the Vancouver station.

C. Biological Environment

1. Terrestrial and Wetland Habitats[32]

a. Principal Attributes

The project area now consists of (1) extensive tracts of pasture and hay fields, (2) relatively small, linear patches of unmown marsh, (3) larger, mown areas, covering perhaps 15% of the project area, containing sedges and presumably other wetland species, and (4) scattered, open stands of poplar and possibly willow on low ridges in the eastern half of the area. Until recently extensive stands of willow, alder, and marshland herbs covered perhaps 40% of the project area. These species would quickly reestablish dominance if the land were managed for wildlife.

The principal wildlife attributes of the project area are its use by wintering waterfowl, raptors, and other marsh birds, and its potential value as habitat for Columbian white-tailed deer.

1) Birds

The project area is located within the Pacific Flyway, which is a major migratory route for many waterfowl species. During the peak migration, which generally occurs from mid-December through mid-January, as many as 15,000 waterfowl have been sighted in

Table 6

AMBIENT AIR QUALITY STANDARDS

Pollutant	National Primary	National Secondary	Washington State
Total Suspended Particulates ($\mu g/m^3$)			
Annual Geometric Mean	75	60[a]	60
24-hr average	260	150	150
Sulfur Oxides (ppm)			
Annual average	0.03		0.02
24-hr average	0.14		0.10
3-hr average		0.50	
1-hr average			0.40[b]
Carbon Monoxide (ppm)			
8-hr average	9	9	9
1-hr average	35	35	35
Photochemical Oxidants (ppm)			
1-hr average	0.08	0.08	0.08[c]
Nitrogen Dioxide (ppm)			
Annual average	0.05	0.05	0.05
Hydrocarbons (Non-Methane) (ppm)			
3-hr average	0.24[d]	0.24[d]	0.24[e]

[a] This is not a standard; rather, it is to be used as a guide in assessing whether implementation plans will achieve the 24-hr standard.

[b] 0.25 ppm not to be exceeded more than two times in any 7 consecutive days.

[c] Applies only 10 a.m. to 4 p.m. PST from April 1 through October 31.

[d] This is not a standard; rather, it is to be used as a guide in devising implementation plans to achieve the oxidant standard.

[e] Applies only 6 a.m. to 9 a.m. PST from April 1 through October 31.

Source: Reference 31.

Table 7

AIR MONITORING DATA FOR CAMAS AND VANCOUVER, 1977

Pollutant	Camas Fuller Building	Vancouver Military Reservation	Vancouver Stations
Particulates ($\mu g/m^3$)			
Annual geometric mean	53	54	43-115
24-hr average	139	197	135-376
Sulfur Oxides (ppm)			
Annual average	0.01	0.01	
24-hr average	0.02	0.04	
3-hr average	0.05	0.09	
1-hr average	0.06	0.11	
Carbon Monoxide (ppm)			
8-hr average		8	
1-hr average		12	
Photochemical Oxidants (ppm)			
1-hr average		0.13	

Source: Reference 31.

the vicinity.[16] Much of the project area has standing water during this period, and the large expanse of water in the wetlands with adjacent pastures attracts many species of waterfowl. Whistling swans, Canada geese, and various species of puddle ducks (e.g., mallards, pintails, wigeon) are the principal species known to visit the area (see Table 8). Large numbers of pintail and wigeon also use the sand bar on the east end of Reed Island during the winter.

The number of waterfowl that use the study area in winter is not large compared to the total number in the region (within 50 miles), but the site is important nevertheless. Most of the waterfowl in the region concentrate on several state and federal refuges (e.g., Sauvie Island, Ridgefield National Wildlife Range), but these refuges are unable to provide food throughout winter. Consequently, waterfowl disperse to other wetlands in late December and January (especially following the close of the hunting season). These late-winter feeding areas are used until migration begins in April. Thus, waterfowl are largely dependent on non-refuge wetlands, including the project area, for three to four months.

The site should be considered important, but not critical, for wintering waterfowl populations in the region. It should also be considered generally important to raptors and other marsh birds, although they are not as dependent on refuges as waterfowl.

Cottonwood Beach and Reed Island support large numbers of song birds, both in winter and summer. Much of the use of the project area is by many small birds that reside in the trees and brush of Cottonwood Beach, and to a lesser extent on Reed Island. Great blue herons feed in the wetlands and grasslands of the project area. Reed Island contains a rookery of approximately 35 great blue heron nests.[33] These rookeries are fairly common along the Columbia River, the primary requirements for a rookery being large trees, usually cottonwood, with a fair degree of isolation; islands are preferred sites. Bald eagles, a threatened species in Washington and Oregon, appear in the area regularly during winter, but their degree of dependence on the area is unknown. Bald eagles frequently associate with waterfowl, and the large numbers of ducks and geese in the wetlands and grasslands probably attract them to the area. The area also is potential habitat for game birds such as pheasants, quail, and mourning doves, but there is ample habitat in the region for these species.

2) Mammals

Mammalian wildlife in the project area has not been inventoried, but the species that can be expected are widely distributed (Table 9). The project area is considered good habitat for furbearers, especially river otters and red foxes, by the Washington Department of Game. This section of the Columbia River is reported to have the "second highest density of aquatic furbearers of any section," including

Table 8

RELATIVE ABUNDANCE OF BIRDS ON STEIGERWALD LAKE, WINTER 1975-76

Species	Percent Occurrence[a]	Mean Number Present[b]
Flocking Species		
Whistling swan	90.2	88.7
Common crow	55.7	64.5
Canada goose	52.5	119.2
Red-winged blackbird	44.3	262.5
Rock dove	26.2	13.9
Starling	18.0	154.6
Mallard	16.4	16.4
Lesser scaup	16.4	7.6
American coot	14.8	101.4
Canvasback	13.1	3.0
Pintail	11 5	75.2
Ring-necked duck	9.8	6.7
Ruddy duck	6.6	16.5
Brewer's blackbird	6.6	41.7
Ring-billed gull	4.9	17.7
Wigeon	3.3	425.0
Solitary Species		
Great blue heron	57.4	2.4
Red-tailed hawk	52.5	2.2
American kestrel	34.4	1.4
Bald eagle	23.0	1.1
Western meadowlark	21.3	6.7
Killdeer	16.4	7.6
American robin	8.2	5.4
Common flicker	6.6	1.3
Marsh hawk	4.9	1.0
Mourning dove	1.6	1.0

[a]The number of days on which birds of this species were seen as a percent of the number of days on which data were gathered.

[b]Average number present when at least one individual was present.

Source: Reference 44.

Note: Continued observation has led to the identification of 85 species of birds using the wetlands.[94]

Table 9

ANIMAL SPECIES INHABITING OR POTENTIALLY OCCURRING IN THE PROJECT AREA[a]

Oppossum	Deer Mouse
Vagrant shrew	Townsend vole
Townsend mole	Muskrat
Shrew mole	Nutria
Little brown bat	Red fox
Yuma bat	Gray fox
Big brown bat	Coyote
Eastern cottontail	Raccoon
Brushrabbit	Mink
California ground squirrel	Striped Skunk
Townsend's chipmunk	River otter
Eastern gray squirrel	Elk
Douglas' squirrel	Black-tailed deer
Northern flying squirrel	Columbian white-tailed deer
Beaver	

[a]Including the Cottonwood Beach area.

Source: Reference 35.

beaver, muskrat, and nutria, as well as otters.[34] Reed Island is also a fawning ground for the black tail deer.

The presence of Columbian white-tailed deer, an endangered species, on Reed Island is strongly suspected, but not well-documented. One reliable sighting on Reed Island has been recorded, and the habitat on the island and on the mainland is typical white-tailed deer habitat. The Columbia White-tailed Deer Recovery Team has identified Reed Island, the mainland, and other islands in the vicinity of Washougal, as possibly inhabited by white-tailed deer, and as possible sites for establishing a white-tailed deer population.

The objective of the recovery team is to establish three or four viable populations at separate locations. The project area, Cottonwood Beach, and Reed Island together appear to be suitable habitat, and could easily be managed for a population of up to 100 Columbian white-tailed deer. Management would require increasing tree and brush cover on the mainland. However, such management would be incompatible with current land-use practices.

b. Quality of the Habitats*

The overall wildlife value of a moderately large tract such as the project area depends on the interrelationships of the various habitats, the variability of vegetation and microclimate among the habitats, and the size of the area. Many species require more than one habitat, and the disruption of only one of those habitats can have repercussions for animals in other habitats; some require structurally complex habitats; and others, particularly large herbivores and carnivores, also require large areas. Size influences quality by limiting the diversity and mixture of habitats.

The habitats within the project area currently are rather uniform and structurally simple, and of moderate extent. In particular, brushy vegetation is absent, both as a component of the marsh and woodlots, and as a distinct habitat. These factors reduce the overall quality of the site by reducing the variety of species that are present. Hence, the area should be considered fair wildlife habitat with a high potential. The area was not rated as potentially excellent because of its moderate size.

1) The Project Area

Wetlands. The present wildlife value of the wetlands during summer is very low because of grazing and low water levels. The water level declines unseasonably rapidly in spring, and the wetlands are greatly reduced in size during summer due to current management practices. Virtually all brush and woody shrubs have been removed. Hence, the number of animal species is very low, and many water-dependent species, such as ducks, are absent during summer.

The value of the wetlands is good during winter, primarily because high water precludes the use of the area by domestic animals and humans. The only human activity in winter is hunting, which does not greatly alter the value of the habitat.

The potential value of the wetlands during both summer and winter is very high. Maintenance of static or slowly declining water levels during spring and summer would greatly enhance the value of the wetlands. Revegetation of brush in the wetlands and tall grasslands surrounding the wetlands, along with retention of more water, would result in a large number of animal species in the wetlands during summer. The value of the habitat would also be improved in winter because of its greater diversity.

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*See Appendix A for an explanation of the method used and a summary of the wildlife habitat assessments.

Grasslands. During summer, the quality of the grassland habitat is fair to poor because of the low variety of plant species and disturbance from grazing and forage harvesting (mostly green-chopped and stored as silage; there is also some grain and corn farming). The unseasonal removal of cover prevents permanent residency by many species usually associated with grasslands. Hence, most use of the grasslands is by species that inhabit surrounding habitats.

The wildlife value of the grasslands during the winter is fair. Disturbance is slightly less than in summer, and the short grass provides good-quality foraging areas for a number of species. However, use is still largely dependent on surrounding habitats.

The potential value of the grasslands is very good. Cessation of cover removal would allow permanent residency and successful reproduction to occur during summer. Species that forage in short grass would be reduced, but a greater variety of species would forage and reside in tall grass during the winter.

Woodlots. The present wildlife value of the woodlots is fair, primarily because of low variety of plant species and removal of the understory. Most of the woodlots are grazed, and most of the brushy and tall grass understory has been eliminated. Consequently, a very significant component of the woodlot animal community is missing. Use still depends on surrounding habitats, although less so than in the grasslands. Strictly arboreal species are probably unaffected by the lack of understory.

The potential value of this habitat is high. Restoration of the understory would replace a significant component of the woodlot. The transition zone between woodlot understory and tall grasslands has also been eliminated; its restoration would materially improve the quality of the habitat.

2) Cottonwood Beach Area

The quality of the Columbia River floodplain (riverward of the dike) as wildlife habitat is very good. The major negative aspect of this wooded tract is the disturbance from recreational use of the western portion during mid- to late summer. However, this disturbance is buffered by the dense understory vegetation. The variety of species is high, stability of populations is high, and disturbance is low. The area is probably at or close to its potential, and Cottonwood Beach is a major source of animals that use the project area.

3) Reed Island

The quality of Reed Island as a wildlife habitat is high. A variety of vegetations (tall trees, short trees, marsh, and reed canary grass) makes it attractive to many wildlife species.

Disturbance is minimal because humans use the island only in mid- to late summer, and their activities are restricted to the beach along the northeastern shore. Reed Island is a secondary source of animals that use the project area.

4) Project Site

The 140-acre expansion site has low wildlife value, although its potential quality is high because of the proximity of wetlands and woodlands. However, much of the site has a long history of use as pasture and hayfield, and generally remained dry even during floods before erection of the dike. (A small, finger-shaped portion of the site is clearly wetter than the remainder, and could be considered an outlier of the adjacent wetland.)

2. Aquatic Habitats

a. Features of the Project Area

Aquatic habitats in the project area consist of ephemeral ponds that form during winter flooding; Gibbons Creek, a small stream that has been artificially straightened in its lower reaches and that terminates at the pumping station at the dike; and the Columbia River. The extent and persistence of ponds and lakes in the project area before the recent land clearance and channelizing of Gibbons Creek are unclear. Numerous maps and aerial photos show different configurations of ephemeral ponds and the now virtually absent Steigerwald Lake. It is clear, however, that substantial portions of the project area were occupied by the lake or flooded in the past.

The Columbia River, which bounds the project area and receives water from Gibbons Creek, has major runs of cutthroat and steelhead trout and chinook, coho, chum, and sockeye salmon. Each species has distinctive migration times, lasting only 2 to 3 months, but the runs are distributed throughout the year. Hence, spawning runs by at least one species can be expected in any month, with several species migrating between June and December.[16] The Columbia is clearly an important national fishery resource, of which Gibbons Creek was a part before construction of the dike.

b. Gibbons Creek Fishery

Available information indicates that prior to construction of the dike, the Gibbons Creek watershed supported a substantial population of anadromous fish.* The watershed evidently was used as a

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*Anodromous fish spend their early life in fresh water and their adult stage in salt water, returning to fresh water to spawn.

spawning and rearing area by sea-run cutthroat and steelhead trout, and by coho and chinook salmon.[36,37]

Prior to construction of the dike, which eliminated the natural outflow of Gibbons Creek to the Columbia River, the U.S. Army Corps of Engineers and the Washington Department of Fisheries agreed upon a combination of an automatic gate and a fingerling trapping facility to ensure continued migratory fish runs.[38] The devices were to be constructed by COE and operated by the Port of Camas-Washougal under the direction of the Department of Fisheries.[19,39]

In August 1967, based on the number of fish trapped in April and May of the previous two years, the Port asked for permission to discontinue use of the trap.[36] The Port received a letter[40] from the Washington Department of Game which it construed as permission to discontinue use of the trap; the Washington Department of Fisheries, which was designated by the Corps to direct operation of the trap, "was not a party to (the Department of Game) response."[36] It remains unclear whether the Department of Game letter in fact constitutes proper release of the Port from its responsibility to operate the trapping facility. During this period, occasional inspection revealed that the trapping facility was not operated properly and that the automatic gate was frequently inoperative, thus effectively eliminating direct access to the Columbia River.[36] Consistent with these observations, there have been no recent reports of anadromous fish in the Gibbons Creek watershed.[36,37,41]

The present fish population of Gibbons Creek appears to consist primarily of cutthroat trout and native suckers and minnows, carp, and sculpins. It is not known if any endangered or threatened species are present. Water quality in the mid- and upper-reaches of the drainage is still excellent. Generally good spawning areas exist in the middle and upper drainage, and the presence of good tree cover in most areas ensures adequate summer flows and tolerable temperatures.[36,37]

In its lower reaches, Gibbons Creek loses its pool-riffle character and becomes a meandering stream and canal with little gradient. It is in this area that dike construction and land development have had their greatest impacts. In particular, the stream-course was diverted, and a sewage-treatment plant releases its effluent into Gibbons Creek. The water quality at the mouth of Gibbons Creek recently has been described as "terrible."[36,37]

c. Restoration of the Fishery

1) Potential Value

At present, there appears to be no anadromous fish production in the Gibbons Creek watershed. This habitat is of particular importance because there are few suitable coho spawning streams along the lower Columbia River. Based on production estimates derived

from flows and usable stream areas, the Department of Fisheries has estimated that the watershed could support a yearly production of approximately 7,000 smolts (juvenile downstream migrants), resulting in a potential catch of about 1,000 adult fish. Although this number is less than 1% of the returning adults in the Columbia River,[16] the value of the Gibbons Creek fishery (commercial and sport) would be about $20,000 annually. The estimated juvenile carrying capacity has been verified by fingerling stocking experiments in the creek.[36]

Similar numbers of steelhead and sea-run cutthroat trout would also be produced if the fishery were restored. While these are of little interest to commercial fishermen, sport fishermen value these species very highly. The chinook salmon, which did occur in the Gibbons Creek watershed and which is a highly valued commercial and sport fish, would presumably also utilize the watershed, but not in large numbers.[36,37]

Most of the potential salmon harvest would not occur in Gibbons Creek; rather, the fish would be taken by commercial and sport fishermen in the ocean and the Columbia River. On the other hand, about half of the steelhead trout and nearly all of the sea-run cutthroat trout harvested would be caught in the creek.[36,37]

2) Problems

Spawning and rearing habitats in the middle and upper reaches of the watershed remain good. Therefore, the major obstacles to restoration of anadromous fish appear to be the water quality in the lower section and the inoperative fish passage between the creek and the Columbia River.

Water quality is affected primarily by effluent from the Washougal sewage treatment plant. A chlorine odor in the effluent has been reported on occasion, and it has been assumed that excessive chlorination caused a fish kill observed in the lagoon area.[36,37,41] The plant is now being modified to incorporate secondary treatment, and the effluent quality should improve considerably. The potential for runoff from livestock operations and a golf course into the creek also exists. This runoff probably would contain a number of biologically active compounds, as well as pesticides. Aside from any direct toxic effect which might occur, many of these compounds would support algal blooms that could decrease the desirability of the habitat for fish life. The quantity of such substances would not have to be large to have an effect, because the watershed does not produce enough flow for substantial dilution during the critical summer period. The effect of these materials on fish life would be greatest during periods of low flow when young fish would be preparing to enter the Columbia. Because upstream migration generally occurs during high water, the effect of dilution, as well as the relatively short time the adults would spend in the lower stream section, would tend to reduce the impacts of materials introduced then.

The fish passage between Gibbons Creek and the Columbia River functions as a barrier rather than as intended in the original design. Gibbons Creek flows were to be handled primarily through an automatic gate at the mouth of the creek. This gate would have permitted upstream and downstream movement of fish between the creek and the river during most flow stages. During the April-May freshet on the Columbia, when higher water would force closure of the gate, downstream-migrating juveniles would be trapped and transferred directly to the river, bypassing the pumps handling creek flows during this period. Few, if any, adult fish would be seeking entrance to the creek at this time. In addition, the pumps, which were designed to handle flows during the freshet and other high-water periods, were to be screened to prevent fish entry and death.[36] Apparently, the facilities have not been operated as intended, and most of the water from Gibbons Creek has been routed through the pumps -- effectively preventing fish passage.

3) Resolution

Mitigation of the problem would have to proceed on at least two fronts. The potential effects of effluents and runoff would have to be minimized. Secondary treatment of sewage should produce an effluent quality adequate to protect any fish in lower Gibbons Creek. However, malfunctions of the treatment plant that result in excessive chlorination or in the release of partially or wholly untreated sewage could be very damaging. The potential severity of the effects is greatest on juvenile fish during low water periods, when dilution is least. Therefore, reliable operation of the sewage treatment plant would be essential. Furthermore, liquid industrial waste would have to be controlled to prevent the entry of toxic or other damaging materials. For similar reasons, contaminated runoff in the watershed should be controlled as well.

The most effective action to restore the fish runs would be proper operation of the fish passage. This would entail letting all water from Gibbons Creek flow through the automatic gate, except during the freshet and periods of high creek flow when use of the pumps might be necessary. Repair of the existing passage and, possibly, modification of the original design would be required, because the automatic gate apparently has been rendered inoperative by rust and siltation.[12,42] Conversion of the gate from a side-hinge design to a flap design may be advantageous. The downstream migrant trap, which was sold to the Department of Game, was improperly sited originally. Also, the pumps are isolated only by trash screens, which permit entry of downstream migrants. Design improvements that should be considered include installation of a Denil fish ladder for upstream use and a Neilson pump to transfer juveniles to the Columbia River.[43] These units generally function automatically and require little observation and maintenance.

Actual restoration of the fish run probably would occur naturally once fish passage was restored. The process could be

accelerated by introducing juvenile fish into Gibbons Creek or by adding fertilized eggs directly into the spawning gravels. With proper operation of the fish passage, the runs should become established fairly quickly and remain self-propagating as long as no major disruptions occurred.

D. Socioeconomic Environment

1. Area and Local Economy

a. Employment

By far the largest employers in the Camas-Washougal area are the Crown Zellerbach Corporation, with about 2,500 employees, and Pendleton Woolen Mills, with nearly 500. The 17 relatively small industrial firms located in the existing Port of Camas-Washougal Industrial Park employ a total of 468 people. About 63% of the industrial park employees live in the Camas-Washougal area and another nearly 32% in the Vancouver area (see Section V.D.).

b. Housing Stock

Data on housing stock and vacancy rates for the Vancouver, Camas, and Washougal areas are detailed in Table 10. The information, which is from the Clark County Public Utility District, is based on the number of active and inactive residential accounts. The vacancy counts may be high because they do not consider whether the house or apartment is either available or fit for occupancy.

As can be seen from Table 11, southern Clark County, including the Camas-Washougal area, is a high-growth region. Growth has been spurred in part in anticipation of the I-205 Columbia River crossing, which will cut the travel time between Camas-Washougal and Portland by approximately 25%, or 10 minutes,[45] and could be spurred further if the currently-discussed third crossing is constructed.

The U.S. Department of Housing and Urban Development (HUD) has adopted criteria to determine when vacancy rates are too low or too high. For a population growth rate between 1 and 5% per year, the rental market vacancy rate should be between 4 and 6%, and the ownership market vacancy rate should be between 1 and 1.5%. A comparison of the actual vacancy and growth rates in Tables 10 and 11 with the HUD criteria indicates that the housing vacancy rates are higher than desirable where the workers in the industrial park now reside.

Nearly all of the single-family homes currently being built in southern Clark County are selling for more than $50,000. Because of the high cost, many people are renting rather than buying, spurring construction of rental units. For example, in Washougal, of 40 dwelling units built in 1976, 30 were duplexes (nearly all with absentee

Table 10

HOUSING STOCK AND VACANCY RATES

Geographic Area	1977 Occupied Units	1977 Vacant Units	1977 Total Units	1977 Vacancy Rate	January-June 1978 Occupied Units	January-June 1978 Vacant Units	January-June 1978 Total Units	January-June 1978 Vacancy Rate	June 1978 Occupied Units	June 1978 Vacant Units	June 1978 Total Units	June 1978 Vacancy Rate
Vancouver												
Corporate limits												
Residential	10,754	457	11,211	4.1	10,867	376	11,243	3.3	10,818	456	11,274	4.0
Apartment	5,833	550	6,383	8.6	6,184	551	6,735	8.2	6,096	778	6,874	11.3
Trailers	217	14	231	6.1	226	9	235	3.2	226	11	237	4.6
Zip code areas (98660 to 98665)												
Residential					36,068	1,736	37,804	4.5	36,249	2,165	38,414	5.6
Apartment					9,468	796	10,264	8.2	9,369	1,116	10,485	10.6
Trailers					1,753	89	1,842	8.1	1,747	112	1,859	6.0
Zip code areas less corporate area												
Residential					25,201	1,360	26,561	5.1	25,431	1,709	27,140	6.3
Apartment					3,284	245	3,529	6.9	3,273	338	3,611	9.4
Trailers					1,527	80	1,607	5.0	1,521	101	1,622	6.2
Camas												
Corporate limits												
Residential	1,712	69	1,781	3.9	1,723	70	1,793	3.9	1,713	92	1,805	5.1
Apartment	326	63	389	16.2	348	60	408	14.7	328	83	411	20.2
Trailers	0	0	0	0	0	0	0	0	0	0	0	0
Zip code area 98607												
Residential	2,942	166	3,108	5.4	3,012	166	3,178	5.2	3,006	215	3,221	6.7
Apartment	350	63	413	15.3	372	60	432	13.9	351	84	435	19.3
Trailers	91	11	102	10.8	101	6	108	5.9	106	5	111	4.5
Zip code area less corporate area												
Residential	1,230	97	1,327	7.3	1,289	96	1,385	6.90	1,293	123	1,416	8.7
Apartment	24	0	24	0	24	0	24	0	23	1	24	4.2
Trailers	91	11	102	10.8	101	6	108	5.9	106	5	111	4.5
Washougal												
Corporate limits												
Residential	1,043	41	1,084	3.8	1,049	40	1,089	3.7	1,047	47	1,094	4.3
Apartment	361	39	400	9.8	421	38	459	9.7	420	48	468	10.3
Trailers	24	7	31	22.6	25	8	33	23.5	23	9	32	28.1
Zip code area 98671												
Residential	2,144	162	2,306	7.0	2,202	156	2,358	6.6	2,199	178	2,377	7.5
Apartment	388	45	433	10.4	451	42	493	8.4	451	51	502	10.2
Trailers	91	16	107	15.0	91	14	105	13.2	90	16	106	15.1
Zip code area less corporate area												
Residential	1,101	121	1,222	10.0	1,153	116	1,269	9.1	1,152	131	1,283	10.2
Apartment	27	6	32	18.8	30	4	34	11.8	31	3	34	8.8
Trailers	67	9	76	11.8	66	6	72	8.3	67	7	74	9.5

Source: Reference 44.

Table 11

HISTORICAL AND PROJECTED POPULATION OF CLARK COUNTY, 1960-2000

	1960	1970	1980	1985	1990	2000	Average Annual Rate of Change (%) 1960-70	1970-80	1980-90	1990-2000
Clark Co.	93,809	128,454	166,300	184,000	201,400	250,200	3.7	3.0	2.1	2.4
Vancouver										
Corporate limits	32,464	41,859	46,463	50,180	53,191	56,425	2.9	1.1	1.4	0.6
Vancouver area (CT[a] 411 to 431)	46,170	63,357	83,316	90,647	98,986	122,465	3.7	3.2	1.9	2.4
Camas										
Corporate limits	5,666	5,790	6,478	6,738	7,008	7,578	0.2	1.2	0.8	0.8
Camas area										
CT 414	2,988	3,096	3,679	4,942	5,514	7,147				
CT 415	2,678	2,550	2,921	3,900	4,329	5,554				
CT 406	3,578	4,128	4,793	5,120	5,438	6,345				
Total	9,244	9,774	11,393	13,962	15,397	19,046	0.6	1.7	3.5	2.4
Washougal										
Corporate limits	2,672	3,388	3,658	3,822	3,994	4,362	2.7	0.8	0.9	0.9
Washougal area										
CT 405.02		1,933	2,528	2,822	3,108	3,924				
CT 405.03		4,439	5,069	5,379	5,681	6,543				
Total		6,372	7,597	8,201	8,789	10,467	--	1.9	1.6	1.9

[a]Census Tract.

Sources: References 48 and 49.

landlords). In 1977, 90 of the 111 dwelling units constructed were duplexes, and another 15 were multifamily dwellings.[46] This trend to lower cost dwellings, including rental units, has continued; in mid-1978, more than 150 mobile home spaces were under construction.

c. Personal Income

Total personal income is directly related to final demand for goods and services, and, therefore, is an indicator of total business activity. In 1975 total personal income in Clark County was $858 million dollars.[47] Based on the ratio of the 1980 to the 1975 county population, and assuming a 3% real growth rate, total personal income in Clark County will be $1,111 million in 1980.

Table 12 shows per capita income in the nation, the Portland SMSA, Clark County, Camas, and Washougal. On the average, per capita income in the SMSA is about 8% greater than the national average. Clark County, on the other hand, tends to lag the SMSA by 12%. Per capita income in Camas runs slightly ahead of the county average (3%). Washougal's per capita income averages 3% less than in the county.

In 1976, the average annual wage or salary in the SMSA was $10,000, whereas the average annual income of employees in the present industrial park was $11,400 (see Appendix D).

2. Demographic Data

There is no resident population on the project site. A very few persons who own or manage property reside elsewhere within the project area. There are no current demographic profiles of Camas-Washougal, but the area evidently is populated primarily by working-class families and many long-time residents retired from Crown Zellerbach and Pendleton Mills. The Port of Camas-Washougal Industrial Park introduced the first significant source of industrial employment not related to the mills.

Much of the recent growth in the Camas-Washougal area has been in anticipation of the completion of the I-205 bridge and has brought a new element to the community. The newer residents, who commute across the Columbia River to their employment in Oregon, tend to be skilled workers with greater incomes and more formal education.

3. Land Use

The 140-acre expansion site is currently being used as pasture for cattle, as is some of the property to the north and east of the project site. There also is some grain and corn farming within the project area. Hunting in winter is the only non-agricultural activity in the project area. To the west is the existing industrial park,

Table 12

PER CAPITA INCOME

	U.S.	Portland SMSA		Clark County			
Year	Amount[a]	Amount[a]	% of U.S.	Amount[a]	% of U.S.	% of SMSA	Amount[b]
1969	$3,733	$4,010	107	$3,497	94	87	$3,191
1970	3,966	4,217	106	3,792	96	90	
1971	4,195	4,540	108	3,994	95	88	
1972	4,537	4,827	106	4,369	96	91	3,824
1973	5,023	5,364	107	4,642	92	87	
1974	5,486	6,003	109	5,201	95	87	4,715
1975	5,903	6,499	110	5,607	95	85	
Average			108		95	88	

	Camas		Washougal	
Year	Amount[b]	% of County	Amount[b]	% of County
1969	$3,254	102	$2,996	94
1970				
1971				
1972	3,967	104	3,742	98
1973				
1974	4,895	104	4,611	98
1975		—		—
Average		103		97

Sources: a. References 47 and 50; b. Reference 51.

Note: Because of the difference in estimates of personal income in References 47, 50, and 51, the percentage of County income in the lower part of the table was calculated using the estimate from Reference 51.

separated from the expansion site by the BPA storage yard. The dike runs along the southern boundary of the property, separating it from the Cottonwood Beach area.

4. Utilities

By virtue of its recent annexation, the project site lies within the City of Washougal, but less than half of the project area is within the city limits. Solid waste collection and natural gas are provided by private companies, whereas electricity is supplied by a public utility. Only water and sewer services are provided by municipal systems. For planning purposes, an Urban Service Area around Washougal defines the region to which Washougal ultimately will supply water and sewer services. The ultimate service area is shown in Figure 7. This area and interim areas will be adjusted periodically as growth trends change.[14,24] At the moment, most new single-family dwellings are being constructed north and east of the city limits. Continued development in these areas, especially in the foothills, is anticipated.[14]

a. Water

Washougal has a municipal water system supplied by eight wells in three locations.[25] A ninth well near the sewage lagoon has just begun operating.[52] The wells are drilled in alluvial deposits of the Washougal River, which make up an aquifer that apparently is recharged by the Columbia and Washougal Rivers. Water is stored in a 1.5 million gallon storage reservoir north of the city.

The capacity of the system is approximately 5.2 million gallons per day (gpd). Average daily use in 1974 was 1.34 million gpd (approximately 660,000 gpd for industrial use); maximum was 3.35 million gpd.[25] With the recent installation of meters, water use has declined, but in the long run per capita consumption is expected to increase again.[52]

Except for the need for a few modifications to arterial lines, the existing system is adequate to meet the current needs of the existing service area. Distribution lines in some isolated sections of the system are inadequate for fire protection, but Washougal has a continuing improvement and replacement program.[25]

b. Sewage

The waste treatment facility for the City of Washougal is a three-cell sewage lagoon occupying 20 acres of a 40-acre site owned by the city in the project area, just north of the proposed project site (see Figure 7). The lagoon is protected from flooding by the Columbia River by the dike. Treated effluent is discharged into the canal that reroutes lower Gibbons Creek to the pump station.[24]

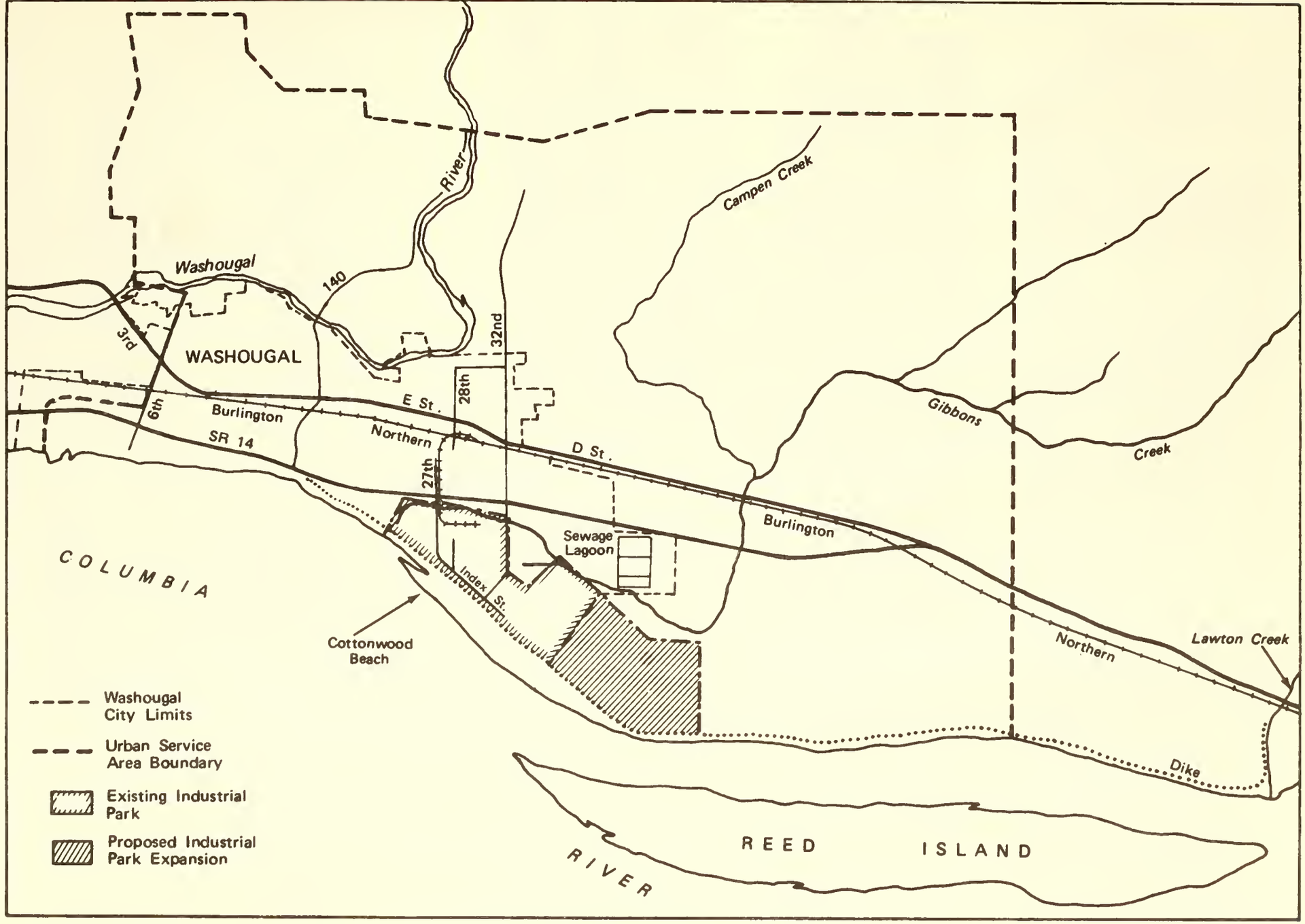

FIGURE 7. URBAN SERVICE AREA

A $900,000 modification to the waste treatment facility has been funded by the U.S. Environmental Protection Agency, and is approximately 50% complete.[52] The improvements will achieve secondary treatment as required under the terms of a National Pollutant Discharge Elimination System permit issued by the Washington Department of Ecology in December 1974. The permit expired in June 1977, and the facility is now operating under a temporary permit. As part of the current improvements, the elevation of the dikes around the sewage lagoon has been raised to 19.5 ft,[53] well above the expected level of flooding due to high runoff in the Gibbons Creek drainage basin (see Section V.B.).

The improved waste treatment facility will have a capacity of 1 million gpd.[52] That will be the maximum discharge allowed by EPA without a level of treatment higher than that which will be provided by the improvements currently being made. Average monthly flow into the lagoon in 1974 varied from 280,000 gpd during the dry summer months to 355,000 gpd during the rainy winter months, with a peak wet-weather flow of 440,000 gpd.[24] The improved, 1 million gpd system is expected to be adequate for a residential population of 16,000. The system currently serves a population of approximately 4,100.[24,53]

The city does not accept industrial waste in its treatment facility. Industries must provide their own storage for wastes and have them removed for disposal elsewhere.[52] The largest industrial user of water and generator of wastewater (the woolen mill, which is not located in the industrial park) provides its own treatment and disposal facilities. Only two other industries use water in excess of that consumed, either in the manufacturing process or for domestic purposes. They limit their use to process-cooling water, do not add any pollutants, and discharge most of the water to the storm drainage system,[24] which is separate from the sanitary sewer system.

c. Solid Waste[54]

In Washougal solid waste is collected by a private contractor. The waste is transported to a landfill and transfer station at English Pit, located between Camas and Vancouver. The landfill capacity is exhausted, but fill is deposited above grade on weekends, when the transfer station is not operating.

From the transfer station, the waste is taken to the privately-owned Leichner Brothers landfill in the northwestern corner of the Vancouver urban area. This landfill has ample capacity, and there are other reserve landfill sites in the county. If industries haul their own waste, they may deposit it either at the English Pit transfer station or at the Leichner landfill.

d. Electricity[55]

Electricity is supplied by the Public Utility District of Clark County. The industrial park is served by a distribution line from the Evans substation, which is located between SR 14 and the railroad, east of 32nd Street. The distribution circuit is presently operating at 40% of its capacity. Long-term plans include shifting some of the load to the substation serving Camas, thereby freeing more capacity for the industrial park.

e. Natural Gas[56]

Natural gas is supplied by the Northwest Natural Gas Company from Northwest Pipeline's 20-inch transmission main, which passes to the west of Washougal. The system has a capacity of approximately 7,000 cubic feet per hour at the end of the gas company's 4-inch main on Index Street in the existing industrial park.

5. Public Services

a. Fire Protection

Within Washougal, fire protection services are provided by the city. In 1976, the city had 2 full-time firemen and 23 volunteers. The 1978 budget allows for an additional full-time fireman. The fire department currently has 2 triple-combination pumper trucks (combination pumper, ladder, water). Another truck would improve fire protection ability.[14]

The City of Camas supports 4 full-time firemen augmented by a volunteer force. The fire department also provides ambulance, rescue, and emergency aid services to southeastern Clark County.[57] Fire protection in unincorporated areas of the county is provided by a network of rural fire protection districts.

The number of fire hydrants in the existing industrial park is inadequate. An estimated 16 additional hydrants are needed to ensure adequate protection against industrial fires. This area also has unsatisfactory "dead end" water lines which should be connected in a grid.[14]

b. Police Services[14]

Police protection within Washougal is provided by the Clark County Sheriff's Department. The County Sheriff also provides police protection for all unincorporated areas. Camas and Vancouver have their own police forces.

Washougal has contracted for police protection from Clark County since 1972. Until then, Washougal had its own police force, which the city found to be a more expensive arrangement. Under the present contract, the city provides a station building in town.[14]

c. Schools[58]

Four of the 9 school districts in Clark County may be affected by population increases resulting from expansion of the industrial park: Camas, Washougal, Evergreen, and Vancouver. Figure 8 shows the boundaries of the 4 districts. School and enrollment data appear in Appendix F.

Increases in enrollments are expected as a result of population growth induced by improved accessibility via I-205, general metropolitan urban expansion, and increased employment opportunities. The major factors that may reduce enrollments are lower birth rates and a lack of employment opportunities.

1) Camas School District

This district serves Camas and the surrounding area. Enrollments in the district are the fourth-largest in the county. The district experienced rapid growth between 1960 and 1965, followed by slower growth between 1965 and 1970. Enrollment declined between 1970 and 1975. Stabilization of enrollment growth appears to be due to declining birth rates rather than outmigration of families.

All Camas schools are in good condition, except one which is considered in poor condition. One school currently is overcrowded.

2) Washougal School District

This district serves the Washougal area, including a small portion of southwestern Skamania County, in which one elementary school is located. Over the past 15 years, the enrollment has increased an average of 1.3%, or approximately 20 new students, each year. Most growth took place in the 1960s. Between 1960 and 1965, for example, enrollment increased by 14.4%, and between 1965 and 1970, by 10.3%. Between 1970 and 1975, there was a 4.1% decline. As in Camas, the decline in enrollment probably reflected declining birth rates rather than families moving away from the Washougal area.

Approximately half of the classrooms at the elementary level are in fair condition. One elementary school and the intermediate and senior high schools are in good condition. The intermediate school is over capacity by state standards.

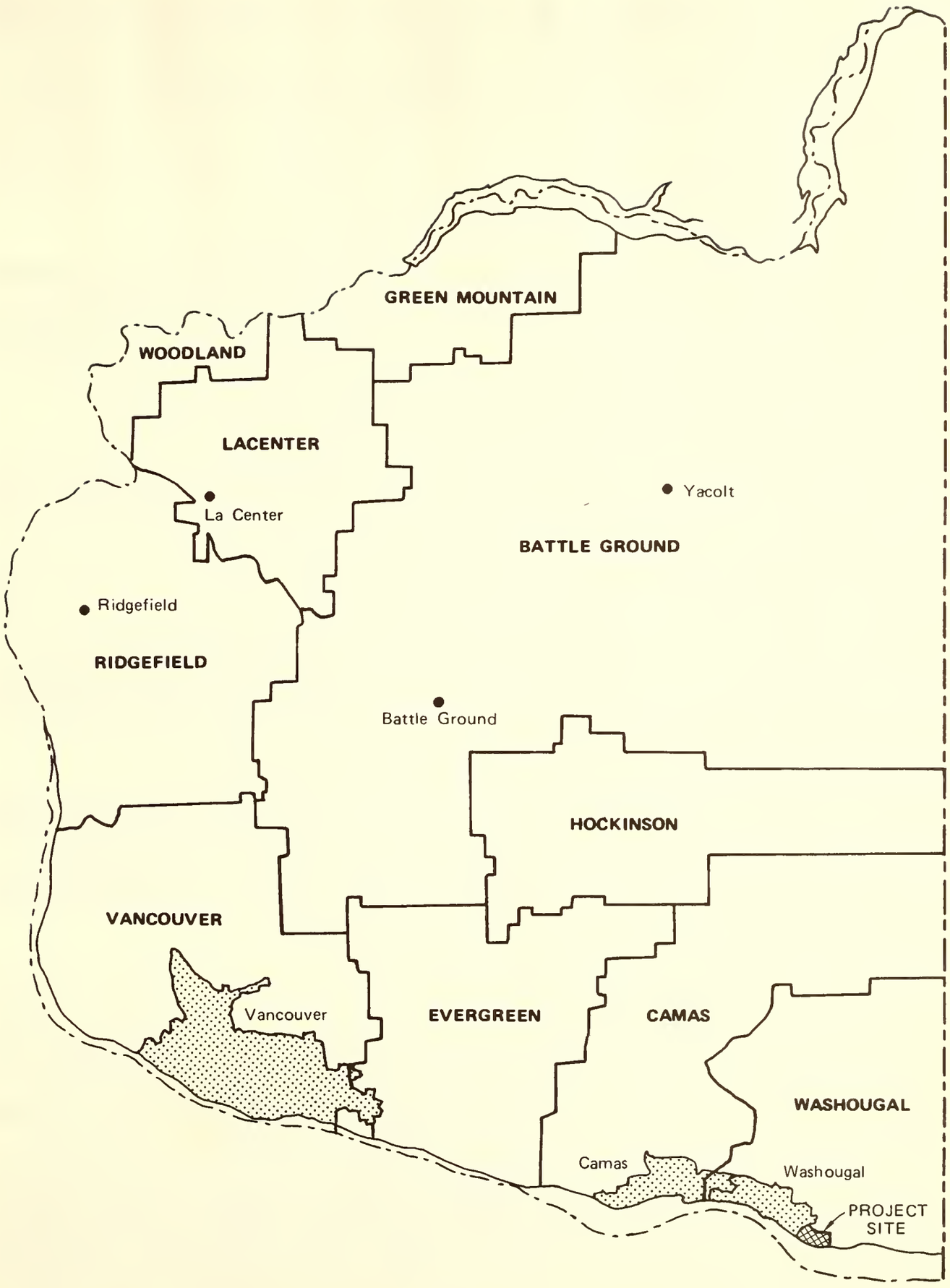

FIGURE 8. CLARK COUNTY SCHOOL DISTRICTS

Most of the facilities are inadequate from the point of view of educational program needs. This is especially true at the intermediate level. Educational programs that are a standard part of most other intermediate curricula throughout the state (such as industrial arts, home economics, art, and communication arts) cannot be accommodated.

3) Vancouver School District

This district enrolls 44% of Clark County students--more than any other district in the county. In 1976, 12 elementary schools were overcrowded. The pressures of growth seem to be greatest in the northern section of the school district, where 4 of 6 planned schools will be located. On the other hand, the southern section of the school district has experienced recent declines in enrollment.

Most of the elementary schools in the district are in only fair condition because of their age. Repair and modernization will be required to keep those schools in effective service.

4) Evergreen School District

This district has had the most rapid enrollment growth in Clark County since 1960. During the past 5 years, enrollment grew in Evergreen while it was declining in most other school districts in the county.

The district's two middle schools and one of its 10 elementary schools are new; the others are in good condition. The high school and one of the two junior high schools are in good condition. The other junior high school is in only fair condition, requiring modernization. A third new junior high school will be completed in 1978.

d. Health Care Services

Most of the health care services in southern Clark County are provided through facilities located in Vancouver. Three major hospitals in Vancouver serve the southwestern Washington area: St. Joseph Community Hospital, Vancouver Memorial Hospital, and the Veterans Administration Hospital. St. Joseph Community Hospital provides full medical and surgical facilities and emergency service (except psychiatric and obstetric care). St. Joseph has 198 beds, and in 1976 had an average occupancy rate of 64%. Vancouver Memorial Hospital also provides full medical, surgical, and emergency facilities, and in addition provides obstetric and dental services not available from St. Joseph. In 1976, Vancouver Memorial had 213 beds and an occupancy rate of 67%. The Veterans Administration Hospital, with 376 beds, is the largest hospital in Vancouver. It provides full medical, surgical, emergency,

dental, and psychiatric services to U.S. military veterans. In 1976, Veterans Hospital had an average occupancy rate of 77%.[59]

A handful of small hospitals and clinics provide specialized services such as psychiatric care, alcohol and drug treatment, and convalescent care. Most of these facilities are located in Vancouver; two nursing homes are located in Camas. Six physicians practice in Camas or Washougal; the rest are located in Vancouver.[60]

A medical center was proposed for a recently approved Planned Unit Development in Washougal. However, specific plans for such a center have not yet been developed.[46]

e. Recreation

In the Camas-Washougal area, neighborhood and regional parks, and the Columbia River meet many recreational needs. Overall, Clark County has about 3,000 acres of parks, of which about 1,500 acres are in the greater Vancouver area.[45] In addition, undeveloped wooded areas and game preserves serve hunters, fishermen, and hikers. School grounds are used when school is not in session. The state game department maintains eight access points for fishing along the Washougal River.[14] Beacon Rock Park, located about 18 miles east of Washougal, is the only improved state park in the vicinity.[14] The state owns Reed Island and probably will develop a small recreational area with minimal facilities for boaters, classifying the remainder of the island as a natural area.[61]

Within Camas, public park land per resident is well above the national standard, with four neighborhood parks and one regional park to serve the residents. Present residential development beyond the city limits makes the addition of neighborhood parks and a regional park desirable.[62]

The City of Washougal has a 9.1-acre park with facilities for picnicking, little league baseball, and swimming. It owns Sandy Swimming Hole, an undeveloped area of 2.85 acres, jointly with Camas. A variety of measures to satisfy unmet recreational needs of city residents have been identified, including establishing greenways along Gibbons and Campen Creeks and making Cottonwood Beach and the area between the dike and Reed Island a greenway as well.[14]

The project area is privately owned and largely in agricultural production, but hunting is permitted. Before the dike was built in 1966, Gibbons Creek was fished for salmon and other game fish. No other active recreation occurs in the project area. The 140-acre site is not used for recreation.

Cottonwood Beach, a popular beach on the Columbia River and one of only three in the county, is across the dike from the project site at a point near the intersection of 32nd and Index Streets (see

Figure 2). The beach is undeveloped. Although it is heavily used, the use is without the encouragement or approval of the owners, the Port and a private landowner.[16] Indeed, neither official access nor dedicated parking space is provided. Subject to purchase of the private holding, the Port has agreed to make minor improvements to the beach in conjunction with the construction of the proposed barge terminal adjacent to Cottonwood Beach. The improvements would consist of cleaning the beach area, providing improved access over the dike, and installing public rest rooms. Ownership would be transferred to the City of Washougal, which would maintain the facility as a municipal park.[16]

f. Social Services

Various organizations serve the specialized social needs of particular groups of people in the county. The range of available services is indicated by the organizations to which the Camas-Washougal Community Chest makes contributions:[63]

- Alcohol Information and Referral Center
- Vancouver Chapter, American Red Cross
- Camas-Washougal Progress Center (which provides education for developmentally disabled children)
- Vancouver Chapter, Campfire Girls
- Health and Welfare Planning Council
- Washington Association for Retarded Children.

The City of Washougal contracts with the Southwest Washington Health District for general public health services. In addition, to comply with state law, the city contributes a portion of its liquor revenues to alcoholism programs.[64]

6. Transportation

The only major highway serving the Camas-Washougal area is Washington State Route 14, a limited-access highway that extends from Vancouver, about 15 miles to the west, along the north side of the Columbia River to Kennewick in eastern Washington (see Figures 1 and 2). The highway has four lanes from Vancouver to Washougal, and two lanes through Washougal and beyond. Traffic is light. Washougal does not have a mass transit system.

Railroad freight service is provided by the Burlington Northern Railroad, whose tracks run through Washougal. There is no passenger service. Water facilities are limited to several public launches on the Columbia River and small drift boat launches on the Washougal River.[14]

A barge terminal on the Columbia River near the project site has been proposed by the Port of Camas-Washougal.[16]

Automobile access to the industrial park is via 27th Street and 32nd Street (see Figure 3). SR 14 can be reached from both streets, but 32nd Street is the only direct route. The construction of wide shoulders on 32nd Street to improve access to SR 14 has been recommended.[14]

Within the industrial park, 28th Street, which is a dead end street running north from Index Street, is longer than the public works standard for an industrial dead end road. This raises the possibility that emergency vehicles could be blocked by congestion from reaching the end of the street. Connection of 28th to 32nd Street has been suggested as a solution.[14]

Trains traveling through or stopped in Washougal delay autos and pedestrians crossing the railroad tracks on 32nd Street, as well as on other streets that cross the tracks. An overpass has been suggested at 32nd Street. A railroad spur along 27th Street extends into the industrial park from the Burlington Northern Railroad (see Figure 3).[14]

7. Aesthetics

The project area is characterized by a mix of the natural and the manmade. The existing industrial park adjoins grazing and farm land and wetlands in the Gibbons Creek area, where natural vegetation and wildlife, primarily birds, abound. All are set against mountains to the north and Mt. Hood to the east. The dike constructed by the Corps of Engineers in 1966 appears in the background. South of the dike is Cottonwood Beach, a sand-silt shoreline outlined by willow and cottonwood trees and other natural vegetation. The visual quality of the area is quite pleasing, given the extensive water and vegetation, and the relatively undisturbed natural setting. The principal eyesore is the Bonneville Power Administration storage yard in the existing industrial park.

8. Historical and Archaeological Sites

Possible historical and archaeological concerns in the project area stem primarily from the existence of known campsites of the Chinook Indian nation in the vicinity of Camas and Washougal, and the extensive explorations of Lewis and Clark along the Columbia River. Campsites of either the Chinooks or Lewis and Clark have historical significance. In addition, the Chinooks frequently used islands as burial grounds, and Reed Island may have served that purpose.

Although much interest has been aroused in the likelihood that archaeological and historical sites may exist around Camas and Washougal, a thorough professional evaluation has not been made. A survey

of the 140-acre project site was conducted in 1976, during which some superficial test cuts were dug. The survey produced no evidence of cultural material.[65]

The only documented sites in the vicinity of the project site are the Van Vleet residence at Parker's Landing and an archaeological site on what is known as the Patterson property, neither of which is in the project area. The first is the home of Dr. Louisa Van Vleet Wright (1862-1913), the only doctor in the area for many years. She moved the house to its present location around 1912 [18] It has been placed on the National Register of Historic Places.[66]

The second site, located between SR 14 and the railroad, just northeast of the sewage lagoon, has been surveyed twice. In 1969, subsurface material was found as deep as 50 centimeters (cm) below the surface.[67] In 1976, arrowheads, fragments of stone tools, and fire-cracked rock were found on the surface in the lower half of the northwest quadrant of the property, but no subsurface material was found below 20 cm. The site, approximately 190 feet by 80 feet, has been disturbed somewhat by cultivation and road construction. The age and character of the site are not known, but it is believed to have been inhabited by the Chinook Indians.[68]

IV PLANNING FOR THE PROJECT AREA

A. Responsible and Involved Agencies

1. Local Jurisdictions

Land use and planning in the project area are the concerns primarily of Clark County and the City of Washougal. The City of Camas has a stake in decisions concerning port development, but it has no responsibility for providing services. Numerous planning documents prepared by Clark County and Washougal are relevant to development in the project area, and are discussed below.

2. Port of Camas-Washougal

The Port was created to foster economic development. By law, its operations are restricted to a specified district. The three Port Commissioners are elected from this district, and within this district, the Port has the authority to buy and sell land and to tax.

Although the Port has adopted standards for development[13] (see Section I.E.3.), it does not have a master plan for either the property it owns or leases, or for development in general within its district.[2] However, the proposed layout of streets and railroad spurs for the 140-acre expansion would facilitate further eastward expansion along the dike in the future.[69] Also, in the past the Port Commission has indicated its intention to develop at least a portion of the remaining project area.[70]

More recently, the Commission has indicated a willingness to participate in long-range comprehensive planning for the project area.[93] It endorsed the need for "a comprehensive land-use plan covering the future usage of all lands" between the Columbia River and SR 14, except for "the approximately 150-acres already developed and the 140-acre tract currently under development." The plan "should establish acceptable uses for all lands within this area and set forth criteria to protect, improve or enhance the natural features of the area."

In its resolution, the Port committed itself "to support whichever agency is selected to supervise and contract for preparation of the plan with funding in the amount of 50 percent of the study cost, not to exceed $50,000.00, subject to the following stipulations:

a. That said planning be initiated on or before December 31, 1978.

b. That monies allocated to the Port through EDA under the 304 and LPW programs for development of the 140-acre industrial tract are certified for use by the Port within the 90-day period following October 4, the period specified under the LPW program for Initiation of construction activities."

3. U.S. Army Corps of Engineers

The Corps of Engineers plays two roles in the project area. The first derives from its construction of the dike and drainage facilities for flood control. After construction, the Port, which was the local sponsor, was made responsible for operation and maintenance of the facilities. By mutual agreement,[39] the Port was to (a) operate the fingerling trapping facility (see Section III.C.2.) under the direction of the Washington Department of Fisheries, and (b) prevent encroachment on improved channels or on ponding areas below 14 feet MSL, unless substitute storage capacity or equivalent pumping capacity was furnished. The Corps retained responsibility for monitoring compliance with this agreement and for inspecting and assuring the safety of the dike system. Any proposed modifications of the system must be approved by the Corps.[71]

The Corps' second role derives from the Federal Water Pollution Control Act (FWPCA). This law assigned responsibility for regulating discharge of dredged and fill material in U.S. waters and associated wetlands jointly to the Corps and the U.S. Environmental Protection Agency (see below). In December 1977, the Corps concluded that its jurisdiction in this matter extends up Gibbons Creek to the point at which the average annual flow is 5 cubic feet per second (this point is well above SR 14, where the creek enters the project area). However, the Corps has not determined the extent of the wetlands associated with Gibbons Creek, so the complete extent of its jurisdiction is uncertain.[71]

4. U.S. Environmental Protection Agency

As noted just above, the FWPCA assigned EPA and the Corps of Engineers joint responsibility to regulate disposal of dredged and fill material in U.S. waters and associated wetlands. Recent amendments to Section 404 of the FWPCA (in the Clean Water Act of 1977) changed the nature of the regulatory program to a federal-state partnership.[72] EPA, given primary federal responsibility, is to issue guidelines defining how state wetland programs should be managed and will review state programs for approval. In general, the states may issue permits to discharge dredged and fill material in U.S. water other than waters that are or could be used for interstate or foreign commerce, and adjacent wetlands. EPA will then review the permits with the assistance of the

Corps of Engineers and the U.S. Fish and Wildlife Service, and may prohibit issuance of permits for environmentally unacceptable projects. The Corps may issue dredge and fill permits on a state, regional, or national basis where state programs do not exist.

B. City of Washougal

Recent annexation has given the City of Washougal immediate and ultimate jurisdiction over the project site. The proposed project generally is consistent with the applicable city plans and ordinances.

1. Comprehensive Plan (1976)[14]

One principal city land use goal is to encourage sound growth and development of residential, commercial, and industrial areas. A supporting policy is to "encourage the orderly development of areas which are environmentally suitable for development and which are currently provided with or planned to be provided with a full range of community facilities and utilities."

The Parks, Recreation, and Open Space Element of the plan recommends soliciting the help of other governmental agencies in cooperative ventures. The plan recommends that Clark County be requested to update the Parks and Recreation Element of the county comprehensive plan to show Gibbons and Campen Creeks as greenways, and Cottonwood Beach and the mainland shoreline opposite Reed Island as greenway areas.

The plan also recommends that the Port of Camas-Washougal be requested to:

1) Designate

   a) Cottonwood Beach as a natural reserve area,

   b) the area between the dike and Reed Island as a natural reserve area, and

   c) Gibbons Creek as a greenway through the industrial area;

2) Encourage and request all industry, new and old, to landscape their areas of business; and

3) Provide support recreational facilities for the users of Cottonwood Beach (e.g., rest rooms and parking).

The Port has taken, or expressed willingness to take, the requested actions to the extent it considers feasible.[2]

2. Comprehensive Zoning Ordinance (August 6, 1977)[73]

Zoning is one of the major methods used by the city to control land use.[14] The Comprehensive Zoning Ordinance is intended to safeguard the general welfare of the citizens of Washougal, promote an orderly, compatible use of land, and further growth along consistent, comprehensive, and permanent plans. By law it must be consistent with the Comprehensive Plan.

All acreage between the dike and SR 14 and within the city limits is zoned heavy industrial (HI). This zone is intended primarily for the use of industry within the industrial park. All conforming uses will be allowed, but it is not intended that residences be permitted.

3. Shoreline Management Master Program (May 14, 1974)[74]

Development of the 140-acre site is not affected by the provisions of the Shoreline Management Master Program. Construction of the dike removed the area within it from the jurisdiction of the Shoreline Management Act because the land there is no longer a floodplain of the Columbia River. The land would qualify for protection if Steigerwald Lake were 20 acres or more, or if Gibbons Creek had a mean annual flow of 20 cfs or more. However, the lake has been drained to the point that there is no year-round body of water other than Gibbons Creek. The creek flow was estimated to be less than, though near to, 20 cfs.

On the other hand, Cottonwood Beach falls within the jurisdiction of the act. Therefore, construction of the barge terminal should comply with the goals and objectives of the Shoreline Management Master Program. These goals include preservation of the natural character of the shoreline, protection of resources and ecology of the shoreline, provision of long-term benefits over short-term benefits, and increased public access and recreational activities for publicly-owned areas of the shoreline. The plans for the barge terminal are not entirely consistent with these goals and objectives because they would change the natural character of a portion of the shoreline. At the same time, construction could be carried out in such a way as to protect the resources and ecology of the adjacent shoreline. In addition, the barge terminal would provide long-term economic benefits to Camas and Washougal, as well as improved access and facilities at the Cottonwood Beach recreational area.

4. Water Systems Facility Plan (1975)[25]

The Water Systems Facility Plan applies to the entire urban service area of Washougal (see Figure 7). The proposed expansion site lies entirely outside the water supply service area as it existed in 1975. However, it is within the low-level service area of the proposed ultimate urban service area boundary, and therefore is consistent with the Water Systems Facility Plan.

5. Sewage Facility Plan (January 1976)[24]

The City of Washougal has statutory authority to construct sewers within 10 miles of the city limits. Clark County has overlapping responsibility through statutes giving it county-wide pollution abatement authority. At the time the Sewage Facility Plan was prepared, the county was not operating, nor planning to provide, any facilities in or near the ultimate urban service area. The plan presents a phased expansion of the current system to meet future needs of the city and adjacent areas. The ultimate urban service area includes the project site, and is identical with the urban service area in the Water Systems Facility Plan. Thus, the proposed development is consistent with the Sewage Facility Plan.

C. Clark County

Five current planning and background documents prepared by Clark County are applicable to land use within the county and the project area.

1. Comprehensive Plan: Goals and Guidelines (July 25, 1977)[22]

The county currently is revising its 1960 comprehensive plan. A Framework Plan (including Goals and Guidelines and a Broad Land Use Circulation Map) was adopted in 1977. The land use and circulation plan component will be completed in 1979, following formal public hearings. Other components will be prepared sequentially.

The fundamental purpose of the comprehensive plan is to guide the physical development of the county. The plan places the project area in the urban land use category, in which industrial development is permitted. The project area, in fact, is now zoned for industrial development, and the proposed expansion is consistent with the plan's concept of locating development within or near cities and towns to provide public services and facilities efficiently.

However, there is potential conflict between the plan and the proposed industrial park expansion on the matter of preservation areas. "Preservation areas are defined by a resource's nonrenewability or by natural conditions that warrant protection." They include natural hazard areas (e.g., 100-year floodplains), ecologically sensitive areas (e.g., wetlands), scenic views and sites, and fish and wildlife habitats. In preservation areas, protection of a resource or natural conditions would be the prevailing goal. Areas qualifying for preservation can occur within urban lands, and in that case, preservation use takes precedence. Thus, to be consistent with the county comprehensive plan, the proposed industrial park expansion should incorporate measures to protect the adjacent wetlands and fish and wildlife habitats.

2. Overall Economic Development Plan (June 1977)[75]

This document was prepared for the Economic Development Administration to maintain county eligibility for funding. It contains Clark County's economic development strategy and plan for Fiscal Year 1977-78 and beyond. Adopted goals and objectives and a priority list of Public Works and Technical Assistance Projects are included.

The goals and objectives for economic development provide a comprehensive framework for guiding future development activities within Clark County. Among the county's goals are:

- Increased Industrial Employment and Diversification
- Maintenance of Agricultural Production
- Effective Management of Fish and Wildlife Resources

The plan assigned first priority to the Port's proposed expansion, and sixth priority to the barge terminal. These public works projects serve the first goal well. The other two goals must obviously be considered in any long-range planning for the remainder of the project area.

3. Industry in Clark County (June 1978)[15]

This document was prepared for reference during industrial development planning in the county. It presents county economic development goals (from Reference 75), discusses local industrial development trends, and projects demand for industrial land. Most importantly, it contains a discussion of industrial site locational and evaluative criteria, and a survey of specific existing sites for industrial development in terms of these criteria.

4. Zoning Map[76]

The official zoning map identifies the entire area within the dike as industrial for purposes of the county's land-use plan, which was adopted in 1960 and is now being updated. According to RPC staff, the draft of the plan will not be available prior to the public hearings scheduled for October. However, no startling changes within urban service areas are likely. Therefore, the updated plan should result in little or no change in county land-use plans for the areas around the project site.

5. Clark County Heritage Program (May 25, 1978)[77]

This proposed program would recognize "unique or special places of greatest public value, . . . encourage (their) conservation and

enhancement, (and) identify and promote opportunities for creating new areas of special public value." With the participation of the citizens of the area, plans for Heritage areas would be developed and included as part of the new county comprehensive plan. Interim land use policies might be necessary to prevent parcellization, rezoning, or issuance of commercial or industrial building permits, and in general to preserve future opportunities.

To date, the Clark County Planning Commission staff has tentatively identified nine potential Heritage areas, including the Stiegerwald Lake-Gibbons Creek wetlands. The special assets of the Steigerwald Lake-Gibbons Creek wetlands are its diversity of wildlife, and the large wetland area, which is valuable for biological productivity, flood control, and open space to buffer the industrial park.

Future land use planning would preserve the wetlands and enough surrounding farmland to ensure a permanent productive wildlife environment. Because the existing wetlands are only a remnant of what once existed, it is especially valuable as a part of the local heritage. Guided nature trails and an outdoor environmental classroom would be ideally suited here. This area, together with Cottonwood Beach and Reed Island, would provide an outstanding diversity of recreation.

The land use concepts are preliminary and intended only to illustrate the potential value that could be created. A great deal more detailed site evaluation and planning would be needed before any decisions on future land use could be reached. However, total development of the land within the dike clearly would be inconsistent with the Heritage concept. On the other hand, the Heritage concept would not be incompatible with the Port's current plans for expansion, and still would allow considerable room for the Port's future expansion needs without intruding on the wetlands.

V ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

A. Introduction

1. Scope

Narrowly viewed, the action to be assessed is EDA funding of the 140-acre expansion. However, the environmental features about which concerns have been expressed would be affected more by development of adjacent land than by the 140-acre expansion alone. For example, wildlife habitat will be diminished by the 140-acre expansion, but much more so if the surrounding area is developed. For this reason, the effects of the proposed expansion in the larger context of development of the adjacent land were considered in the impact analysis.

This approach is justified further by the fact that the proposed expansion clearly brings conversion of adjacent land closer to reality. The layout of streets and railroad spurs on the expansion site will make eastward extension easy.[69] The Port Commission has indicated interest in future development of other land in the project area.[70] If the proposed barge terminal is shown to be economically feasible, additional demand for land in the industrial park will be generated.[16] Further, private landowners in the project area have expressed the intention to develop their lands. Thus, the proposed expansion evidently will bring more land in the project area under pressure for development and lead to future impacts that can justifiably be attributed to it. This approach also is consistent with the intent of NEPA that potential cumulative impacts of a proposed action be analyzed.

Full development of the project area* generally means occupancy of most or all of this land by industrial firms. Development and full occupancy of the project site is projected to take about 9 years. At the same rate of development, 75 to 100 years would pass before the project area was fully occupied. However, preparation of land probably would precede occupancy by several years, and decisions to develop the land would be made many years before that. On the other hand, one or several large firms could absorb a substantial portion of the available land in less than a decade.

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*The 140 acres on which the industrial park expansion is proposed are the project site. The remainder of the land between the dike and SR 14, and between Lawton Creek and the existing industrial park, is called the project area.

Presidential Executive Order 11990, Protection of Wetlands, applies to the proposed industrial park expansion. This Executive Order states that:

> Each Agency . . . shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the Agency's responsibilities for . . . providing federally undertaken, financed, or assisted construction and improvements. . . .[26]

By Presidential Executive Order and its own regulations,[92] EDA "shall not participate in any action that would impact a floodplain or wetland until that organization unit determines that no practicable alternative exists to that action." The administrative order also states that "impacts are indirect results of an action whenever an action induces or makes possible related activities which affect the natural values and functions of floodplains or wetlands."

When EDA evaluates alternatives and mitigation measures for the proposed expansion, it must consider the possibility that the proposed industrial park infrastructure (i.e., water and sewer lines, streets, and railroad spurs) may be extended in the future -- in other words, that it "induces and makes possible related activities" (e.g. future port expansion, a barge terminal) that may further adversely impact the Steigerwald Lake wetlands.

Furthermore, "wetlands" are defined in the Executive Order to include areas "inundated by surface or ground water with a frequency to support and under normal circumstances . . . would support a prevalence of (wetland) vegetative or aquatic life" (emphasis added; see Section III.B.2 c.).[26] This requires EDA to consider effects of development on potential wetlands, especially historical wetlands that perhaps could be restored.

The proposed infrastructure design would permit further expansion beyond the 140-acre site. In addition, the wetlands adjacent to the project site are currently zoned for industrial use by the county. Because it appears that all practicable alternatives to the proposal before EDA involve some adverse impact on the Steigerwald wetlands, it is important that "all practical measures be taken to minimize harm to (the) wetlands" as required by the Executive Order. (See Section VI.)

The preceding observations together with the vulnerability of the natural environment to incremental changes (see Section V.C.) indicate that considering the impacts of full development is appropriate.

2 Basis of Analysis

The analysis used the best information available. Nevertheless, many of the results reported below must be considered speculative,

albeit reasoned, plausible, and highly probable. The reason for this is that essential details of the development of both the project site and project area currently are unknown, and in fact are unknowable before development occurs. Until then, developmental impacts can be assessed only by making assumptions about the characteristics of the development based on past Port development and stated intentions of the Port.

For example, precisely what industries will locate in the expanded industrial park is unknown. However, the Port's apparent goal is to attract small and medium-sized, diversified, and relatively "clean" industries similar to those in the existing industrial park.[3,13] Therefore, for the impact analysis, it was assumed that this goal would in fact be achieved.

If the composition of firms locating in the expanded industrial park is markedly different from this assumption, the analysis reported in this section is invalid. Such a difference is possible because the project site is zoned "heavy industrial" by the City of Washougal. Given the cumulative nature of the city's zoning ordinance, this zone designation could accommodate virtually any industry.

Although the Port's development standards are more restrictive, the decision on the acceptability of any given firm will be made by the Port Commission. Of course, the commission can act only within the constraints set by other federal, state, and local laws and regulations. Thus, other federal, state, and local agencies could prevent firms with disproportionately adverse environmental impacts from locating in the expanded industrial park.

3. Prior EDA Grant

A Public Works grant awarded to the Port by EDA in 1973 was used to help prepare the land roughly between what is now 27th and 32nd Street (see Figure 2).[75] The project included dredging in the Columbia River, landfilling (including filling of part of the drainage system constructed at the time the dike was built), installing railroad spurs, and constructing streets and storm sewers. In addition to the $260,000 grant from EDA, the project was financed by an EAA loan for $75,000 and Port revenue bonds valued at $209,000. The entire 32-acre site has since been developed and fully occupied.

The dredging operation was expected to create temporary problems of turbidity, toxicity, low oxygen levels, and reduced light levels, and thereby affected fish and other marine organisms.[78] These problems presumably were minimized by operating requirements specified in permits issued by the Corps of Engineers and the Washington Department of Fisheries. Application of the dredge spoils further altered the character of land behind the dike, as well as completely modifying the fill area itself.[78] The implication of incremental losses of relatively unmodified land can be understood by referring to the discussion of probable impacts in this section. Another important effect of the

prior EDA grant was that it made possible subsequent development of the parcel occupied by the Bonneville Power Administration and made the site of the current proposed expansion very attractive.

B. Physical Resources

1. Land

a. 140-acre Expansion

The proposed project site is approximately 10 feet in elevation above the adjacent wetlands. Wetlands are a fragile combination of hydrological, geological, and biological conditions. Seemingly insignificant changes in a watershed can result in significant ecological effects. However, by being aware of potential problems, it is possible to plan development to protect the land resources of the adjacent project area.

The 140-acre expansion will have a small effect on the land if proven erosion-prevention measures are taken during the construction. Also, if development is spread out over time (as planned), erosion control will be easier.

No effects on mineral resources are expected. Adequate supplies of sand and gravel are available in the vicinity, and are superior to those found on the project site.[22]

The project site is located where earthquakes of moderate size can be expected (see Section III.B.1.).[80] Because the entire Gibbons Creek/Steigerwald Lake area is underlain by unconsolidated sediments, a moderate earthquake that caused foundations to shift and groundwater levels to change could result in significant damage. In addition, soils in the area have moderate shrink-swell potential and high compressibility, which can create significant problems if not considered in the design of structures.

b. Full Development

In the long run, full development would irretrievably commit the project area to conversion from pasture to industrial uses. If development were phased, structural design were adequate, and erosion-prevention measures were taken (see Section VI.A.), effects on land resources could be kept minimal.

c. Associated Development

The 140-acre expansion will create approximately 1,000 new jobs over 9 years and will lead to an influx of population. Therefore, increased residential construction in the Gibbons Creek watershed can be

expected. As discussed in Section III.B.1. the potential for severe erosion in this watershed exists because of the character of the soils and the steepness of the slopes. Denudation of the vegetation in the upper reaches of the watershed could cause gullying and erosion.

Sediment would clog the banks and bottoms of the creek and its tributaries, destroying the riparian habitat and decreasing the creek's value as a fishery. In the high runoff months of October to March, the sediment would be flushed into the former Steigerwald Lake area and be trapped. The sediment would be left behind when the water was pumped over the dike and would eventually destroy the wetlands, thereby reducing the capacity of the area to contain storm runoff.

Currently, there is little development in the Gibbons Creek watershed, and the flow of sediment into the former Steigerwald Lake area is probably small. Monitoring and controlling development in the Gibbons Creek watershed will be necessary to control sediment flow and to protect the wetlands.

2. Water

a. 140-Acre Expansion

Table 13 presents the estimated elevation of flood waters in the project area for storms of varying duration. As shown, the existing pumping capacity can keep floodwaters within the 14-foot contour up to a 10-year storm assuming maximum pumping rate. However, at the minimum pumping rate, the 14-foot elevation will be exceeded by a 10-year storm lasting 3 to 5 days. These elevations compare with the original drainage system design in which the maximum elevation of flood waters was to be limited to 13 feet, with 1 additional foot of elevation serving as a contingency margin.

Following Reference 4, a 5-day winter storm was considered the reasonable worst case of surface runoff. Table 13 shows that elevations higher than 14 feet can be attained with as little as a 10-year storm. Therefore, during a 20-year period, floodwaters could be expected to exceed the 14-foot elevation from 2 to 4 times, assuming no change in pumping capacity. The project site, which is generally at or above elevation 20 feet, should not be affected by flooding due to storm runoff. On the other hand, portions of the existing industrial park are at risk. A 50-year storm would flood the existing industrial park in those areas below about 17 feet elevation. These facts indicate that additional pumping capacity is necessary, in the short run, to protect against very severe storms, and in the long run, to protect new development, if land below about 17 feet elevation in the project area is filled.

Water quality in lower Gibbons Creek and the wetlands could be adversely affected by surface runoff from the project site. Precipitation falling on paved surfaces will pick up substantial

Table 13

FLOOD WATER ELEVATIONS IN THE PROJECT AREA
(in feet MSL)

A. Assuming Maximum Pumping Rate

Storm Frequency of Occurrence	Storm Duration (days) 1	2	3	5
5-year	11 9	11.8	11 7	9.6
10-year	13.1	13.0	12.4	12.3
50-year	14.7	15.4	15.8	16.0
100-year	15.5	16.3	16.9	17.1

B. Assuming Minimum Pumping Rate

Storm Frequency of Occurrence	Storm Duration (days) 1	2	3	5
5-year	12 4	12 8	13.2	12.9
10-year	13.4	13.7	14.2	14.3
50-year	15.0	16.0	16.7	17.2
100-year	15.8	16.9	17.7	18.2

Notes: a. Line indicates when 14-foot elevation is exceeded.
b. Pumping rate depends on total "head" (see Appendix B).

Source: See Appendix B.

quantities of hydrocarbons, sulfates, lead, nitrates, and other organic compounds. It is not possible to quantify the types and amounts of contaminants that might enter the watershed without more information about the nature of industries locating in the industrial park and the amount of associated traffic. The Port has proposed to trap floatable materials before surface runoff is released to the watershed. However, the runoff control plans need to be improved (see Section VI.D.). Furthermore, because wetlands are able to filter contaminants out of water, any reduction in the size or character of the wetlands would have an additional adverse effect on water quality.

b. Full Development

Full development of the project area, whether or not the wetlands are preserved, would significantly affect the hydrology of the area. Groundwater movement is primarily from the north (Gibbons Creek) and the south (Columbia River), with discharge in the former Steigerwald Lake area. Because local groundwater movement is over short distances, overall groundwater quality and the aquifer yield would not be affected by development.

On the other hand, surface runoff into the wetlands from industrialized land would be higher than that estimated for development of the 140-acre site alone. The increase in surface runoff can be crudely estimated. The area behind the dike represents approximately 30% of the total watershed, but accounts for only 10 to 20% of the total surface runoff because of differences in runoff coefficients (see Appendix B). Therefore, developing the project area, which would change the runoff coefficient for the area, could increase estimated surface runoff by 20 to 40%, depending on the acreage involved. Coping with such an increase would require substantially greater pumping capacity. Further analysis would be required to determine the economic tradeoffs between additional pumping capacity and the preservation of floodwater storage area.

Full development would increase not only the volume of surface runoff, but also its velocity. An increase in the velocity of uncontrolled runoff could create new drainage channels and destroy vegetation with rapid overland flow.

c. Associated Development

Increasing urbanization in the Gibbons Creek watershed will increase runoff into the project area beyond estimates made above for full development of the project area. Wherever impermeable surfaces replace natural vegetation, runoff will increase. Denudation of vegetation in the watershed for home construction or for land clearing also will increase runoff. As discussed in Section V.B.1 construction in the watershed could also cause erosion. The resulting sediment would be

trapped in the drainage canal and wetlands, and reduce the available floodwater storage volume.

Given such possible future changes in the watershed, the earlier discussion of runoff for full development of only the project area underestimates the potential problems of full development. If associated upstream development is accounted for, storms of a given size would have larger runoff and would flood to higher elevations than those shown in Table 13. The effects of upstream development on the project area cannot be quantified, but the potential problems are nevertheless apparent.

3 Air

a. Emission Restrictions

Emissions from industries in the expanded industrial park will be limited by the development standards of the Port, which will control the type of industry accepted, and by emission controls and other requirements imposed by the Southwest Air Pollution Control Authority (SWAPCA).

The development standards will limit firms in the industrial park to Class 1 ("light scale") and Class 2 ("medium scale").[13] Class 1 includes light, clean industries, usually manufacturing concerns, whose industrial wastes are easily disposed of, and which usually create little or no air, soil, or water pollution, and no nuisances such as noise or objectionable odors. Class 2 consists primarily of large-scale fabricators, primary metals manufacturers, and lumber companies, which are relatively clean, with little or no pollution or odor. The performance standards for air pollution are:

(1) Smoke -- The emission of smoke from any chimney, stack, vent, opening or combustion process shall not be permitted, conforming to the measurement of Ringelmann zero.

(2) Open Burning -- No open burning will be permitted.

(3) Odors -- The emission of offensive odors in such quantities as to be readily detectable at any point beyond the property line is prohibited. Noxious, toxic, and corrosive gas emissions shall be treated by full control techniques.

(4) Particulate Matter -- The rate of emission of a particulate matter from all sources within the property line of a lot shall not exceed a net figure of 30 grams per acre of lot area during any one hour.

The development standards also state that:

> All measurements of air pollution shall be by the procedures and with the equipment approved by the Southwest Washington Air Pollution Authority and the State Department of Ecology or equivalent. Persons responsible for a suspected source of air pollution, upon the request of the Port, shall provide quantitative and qualitative information regarding the discharge that will adequately and accurately describe operation conditions. Any prospective tenant desiring to locate in the Port of Camas-Washougal Industrial Park who is suspected of having air pollution problems shall be prepared to have its plans and specifications reviewed by the Southwest Washington Air Pollution Authority and the State Department of Ecology prior to final approval of plans by the Administration of the Port of Camas-Washougal.

In place of explicit standards for pollutant emissions, SWAPCA requires the application of advanced air pollution control technology.[27] Applicants for the industrial park would require SWAPCA approval. SWAPCA's expressed intentions are to reject any industries that would use a large fraction of the airshed capacity in relation to the increase in employment.[83]

b. Emissions

Any increase in air emissions from expansion of the industrial park would result from three principal sources: (1) direct emissions from the industries, (2) emissions from motor vehicle traffic generated directly by the industries, and (3) emissions from traffic associated with the population growth induced by the industrial park expansion.

Table 14 shows the estimated industrial and auto emissions in the Camas Washougal area for various years and different levels of expansion of the industrial park. Emissions from the existing industrial park are small in relation to the area's total industrial emissions, but the actual values are uncertain. Estimated emissions from the existing industrial park were used to estimate emissions from firms locating in the expanded industrial park by assuming the same emission rates per acre for the future firms. This approach was necessary because the incoming firms and their pollution characteristics are unknown (see Section V.A.2.).

The traffic generated directly by the industrial park will be much smaller than the total increase in traffic associated with the induced population growth. The estimate of traffic emissions was based on the increase in traffic from the additional population, and on the assumption that traffic generated directly by the industrial park would be accounted for in that category.

Table 14

AIR POLLUTANT EMISSIONS IN CAMAS-WASHOUGAL, WITH AND WITHOUT EXPANSION OF THE INDUSTRIAL PARK

Year and Status of Industrial Park Expansion	Annual Emissions (tons)				
	Particulates	SO_2	NO_x	HC	CO
1978					
Industrial park	37	22	3	9	5
Other industry	1,613	1,978	1,327	111	3,985
Autos	-	-	311	602	5,192
Total	1,650	2,000	1,641	722	9,182
1985 without industrial park expansion					
Present industry	1,650	2,000	1,330	120	3,990
Autos	-	-	265	336	3,398
Total	1,650	2,000	1,595	456	7,388
1990 without industrial park expansion					
Present industry	1,650	2,000	1,330	120	3,990
Autos	-	-	233	266	2,439
Total	1,650	2,000	1,553	386	6,429
1985 with 140-acre industrial park expansion 2/3 complete					
Present industry	1,650	2,000	1,330	120	3,990
New industry	62	37	5	15	8
Autos	-	-	308	391	3,951
Total	1,712	2,037	1,643	526	7,949
1990 with 140-acre industrial park expansion					
Present industry	1,650	2,000	1,330	120	3,990
New industry	93	55	8	23	13
Autos - 7.6 employees per acre	-	-	273	325	2,984
Total - 7.6 employees per acre	1,743	2,055	1,611	468	6,987

Table 14 (Continued)

Year and Status of Industrial Park Expansion	Annual Emissions (tons)				
	Particulates	SO_2	NO_x	HC	CO
1990 with 140-acre plus another 500-acre industrial park expansion					
Present industry	1,650	2,000	1,330	120	3,990
New industry - 140 acres	93	55	8	23	13
New industry - 500 acres	335	198	29	83	47
Industrial subtotal	2,078	2,253	1,367	226	4,050
Autos	-	-	453	540	4,956
Total	2,078	2,253	1,820	776	9,006
2000 with 640-acre industrial park expansion					
Present industry	1,650	2,000	1,330	120	3,990
New industry	438	153	37	106	60
Autos	-	-	510	608	5,579
Total	2,078	2,253	1,877	834	9,629

Source: See Appendix C.

For the pollutants NO_x, HC, and CO, the additional emissions arising from traffic associated with the induced population will be much larger than direct emissions from new firms. However, as time passes, reduction in auto emission rates due to tightening emission standards and turnover of vehicles will offset the effects of the traffic increase. Consequently, by 1990, with the proposed 140-acre expansion, NO_x emissions will be slightly lower, but HC and CO emissions will be substantially lower (35% and 24%, respectively) than at present. Particulates and SO_2 emissions will be about 6% and 3% higher, respectively.

If 500 more acres in addition to the proposed 140 acres were added to the industrial park by 1990, the increase in particulate and SO_2 emissions would be 26% and 13%, respectively. However, these figures are quite uncertain because the composition of the additional firms is unknown. The expected reduction in auto emission rates by that time would approximately offset the effects of traffic growth on the NO_x, HC, and CO emissions.

c. Air Quality

If the emission rates per acre of the industries locating on the project site are no higher than those of the present industrial park, the expansion will not in itself result in the deterioration of the air quality. However, the additional traffic associated with more rapid population growth would prevent as much reduction in auto emissions as would otherwise occur. In particular, HC and CO emissions would otherwise decline substantially. Because HC emissions contribute to the production of photochemical oxidants, and the nearby Portland and Vancouver urban areas are non-attainment areas for this pollutant, development of the project site will tend to work against the needed improvement in oxidant levels. HC emissions will still be reduced by 35%, but without the proposed development they would have been reduced by 47%.

If 500 acres in addition to the 140-acre project site were developed, automobile emissions would be approximately the same as at present, thus offsetting the improvement in air quality that would otherwise occur. If particulate concentrations increased in proportion to the increase in particulate emissions, the particulate standard would be exceeded.

Many firms locating in the industrial park might move from other parts of the Portland-Vancouver metropolitan area. These firms may otherwise have expanded or located elsewhere in the metropolitan area. In these circumstances, the net increase in emissions within the metropolitan area due to expanding the industrial park would be less than the total calculated in Table 18. Air quality is primarily a problem for the entire metropolitan area or the entire air quality control region, rather than for the Camas-Washougal area in isolation.

C. Biological Environment

1. Terrestrial and Wetland Habitats[32]

The overall impacts of the proposed industrial park expansion on wildlife will not be great. In fact, with a few exceptions, impacts associated with developing various portions of the project area would be relatively minor. However, each potential development effort is only one step in the probable development of the area over the long-term. The overall effect would be quite large, since the value of the area to wildlife depends to a considerable extent on the presence of several interspersed habitats. Nearly all species require more than one habitat, and the lack of any one may reduce populations in all other habitats. Thus, the integrity of the entire area is a very important factor influencing the welfare of wildlife.

The proposed 140-acre expansion will disrupt, but not destroy, the integrity of the project area. Full development of the project area, however, would seriously compromise its ecological integrity, and the net effects probably would be greater than the sum of the separate effects of piecemeal development. Equally important, the impacts would be irreversible, for all practical purposes. Thus, the net result of piecemeal development would clearly be a gradual and permanent degradation of wildlife habitat and accompanying loss of wildlife.

a. 140-Acre Expansion

1) Expansion Site

On the 140 acres to which the industrial park will be expanded, effects on vegetation will consist primarily of replacing the hayfield with streets, buildings, lawns, and occasional roadside weeds. Wildlife will be nearly eliminated. The site will support only starlings, rats, and pigeons after development.

The seeps and the natural drain will be eliminated. Even if the natural drain were retained, it would be so altered by development that it would be of little value to wildlife. Thus, the project site will lose even its currently modest value as wildlife habitat.

2) Adjacent Wetlands

Any effect on the wetlands will be mostly on the portion immediately adjacent to the project site. Noise, human activity, and structures will cause some species, such as eagles, swans, and geese, to avoid the areas adjacent to the industrial park. The zone of disturbance will vary by species; larger species will be more easily disturbed than smaller ones. Deer, for example, will be more sensitive than rodents.

Expansion of the industrial park should not materially increase these forms of disturbance during summer, when recreational use of the beach is heaviest. However, it will be a significant increment during winter. In any case, to the extent that wildlife are driven from the area by disturbance, they will largely die rather than simply move away, because adjacent habitats probably are supporting as much wildlife as they can in the long run.

Water regimes in the wetlands will be modified only slightly, and will not exhibit obvious effects. Runoff will contain various noxious chemicals that may enter the wetlands and adversely affect water quality. The effect of chemicals cannot be predicted because the types and amounts of chemicals that will be discharged are unknown at present, but the quality of initial runoff from parking lots and similar surfaces is generally low. If runoff is controlled (see Section VI.D.), this source of potential impacts will be greatly reduced.

3) Grasslands and Woodlots

Grasslands will be affected in a manner similar to the wetlands: the greatest effects will be from disturbance. Development of the 140-acre site will eliminate a large amount of grassland. Woodlots will probably not be affected.

4) Cottonwood Beach and Reed Island

Impacts on Cottonwood Beach and Reed Island will be indirect. The project site will block movement of animals from Cottonwood Beach to the grasslands and wetlands. For small animals, the blockage will be complete; for large animals, it will not. Because many species now inhabiting Cottonwood Beach forage in the grasslands, their numbers may dwindle. The species affected and the degree of effect will depend on the adaptability of the animals and the availability of other foraging areas.

b. Full Development

1) Wetlands

If virtually all land above the 14-foot contour were developed for industrial uses, and the Gibbons Creek watershed became urban-residential, the wetlands would be severely affected. They might be subjected to runoff containing various chemicals from the industrial sites and from Gibbons Creek. Water levels would fluctuate erratically because of increased rates of runoff and the need to remove water to prevent flooding. In effect, the wetlands would become a catch basin containing little water except during periods of heavy rainfall. Unseasonally varying water levels would reduce the value of the wetlands to wintering waterfowl from fair to poor. During summer, the value of

the habitat also would be poor. Elimination of adjacent grasslands would prevent upland-nesting marsh birds from using the wetlands. Also, little vascular aquatic vegetation is likely to grow, and hence, overwater-nesting species would not be present.

Some mitigation would be possible by intensively managing the wetlands (i.e., the land below 14 feet) for wildlife, principally by reducing fluctuations in the water level and retaining as much water as possible during summer. However, it is unlikely that the value of the wetlands could be maintained at its present level, because associated habitats would be lost, and because the wetlands alone are too small to provide the isolation needed by many species.

2) Grasslands and Woodlots

Under full development, virtually all grasslands and woodlots would be eliminated, and their value to wildlife would be almost nil. About the only animals associated with the industrial park would be starlings, rats, and pigeons. The loss of grasslands and woodlots also would contribute to the decrease in value of the wetlands by eliminating the margins between habitat types and the mixture of habitats.

3) Cottonwood Beach

If the beach recreation area were not developed, the impacts on wildlife would be restricted to disturbance from human activity, elimination of foraging areas in the grasslands and woodlots, and inhibition of movement between the beach and the wetlands. The extent of such impacts is difficult to assess, but it would probably be minor. If the barge terminal were constructed, however, the impacts on wildlife would be considerable. Disturbance from human activity would be great. Removal of the aquatic vegetation and shallow water habitat would also decrease the value of the habitat to both fish and wildlife. The value of the habitat would likely be reduced from good to fair.

Severe impacts on the Columbia River bank willow or other floodplain plant species other than actual displacement by facilities are not anticipated. These species are typically restricted to the periodically disturbed floodplains, and are dependent on physical disruptions which simulate the effects of normal erosion and sedimentation.

4) Reed Island

Potential impacts on Reed Island are difficult to assess because the relationship of animals on Reed Island to the mainland is unknown. However, any movement of animals to the project area would be eliminated or greatly reduced by full development. Great blue herons nest on Reed Island, and apparently feed extensively in the

grasslands and marsh. Those foraging areas, for all practical purposes, would be eliminated. Effects on the nesting colony cannot be predicted; other foraging areas may or may not be available. If Reed Island were developed as a state park, the impacts on wildlife would be greater, but it is not possible at present to predict what those impacts would be.

c. Endangered and Threatened Species

Only one endangered species, the Columbian white-tailed deer, is believed to live in, or adjacent to, the project area (see Section III.C.1). Expansion of the industrial park would reduce slightly the size of the population of white-tailed deer that could be sustained. Development of the 140-acre site has a slight probability of adversely affecting the current population, if one exists (the status of the population is currently undetermined). Full development, however, would have a high probability of eliminating the current population, and it would certainly eliminate the option of managing for white-tailed deer.

The bald eagle, a threatened species in Oregon and Washington (but endangered in the remainder of the continental United States), frequents the area during winter. Development of the project site will reduce the frequency with which eagles visit the site because of a slight decrease in the abundance of waterfowl, and because of increased human activity. The overall effect on the abundance of eagles cannot be predicted. Full development would probably cause eagles to abandon the area because of the low abundance of waterfowl and the high level of human activity. Thus, this foraging area, apparently of high value as judged by the frequency with which it has been visited by bald eagles, would be lost. The overall effect on eagle populations cannot be predicted, but there is a moderate probability that the effect would be measurable.

Comments on the nature and magnitude of the impacts of the proposed industrial park expansion will be solicited formally from the U.S. Department of the Interior through this EIS process.

2. Aquatic Habitats

a. 140-Acre Expansion

There are no fish runs at the present time in Gibbons Creek. Therefore, development of the expansion site will have no effect on such runs.

If runs were restored, development of the 140 acres would have only a minor effect because the proposed development would occur in an area which receives relatively little long-term use by migratory fish. The major potential effects on any non-migratory as well as anadromous fish are related to runoff and effluents containing biologically

active compounds, as well as turbidity resulting from erosion at the construction site. If these sources were controlled, no significant impacts would occur.

b. Full Development

Full development probably would have effects on aquatic habitats similar to those resulting from development of the 140-acre site alone. As long as biologically active substances and turbidity were controlled and the stream bed undamaged, effects in the project area would remain minimal. However, the effects of associated development probably would increase at a rate comparable to the increase in industrial expansion.

Increased residential building in the upper Gibbons Creek watershed would probably have relatively severe effects on migratory fish runs because spawning and juvenile growth occur in the upstream areas. Increased erosion would result in siltation of the spawning gravels and a reduction in spawning success. Reduction of tree cover would result in greater stream-flow fluctuations and reduce the all-important summer flows needed for juvenile survival. (Coho, steelhead, and cutthroat all spend one year in freshwater before heading to the ocean.) Reduction of tree cover would also result in higher summer temperatures, which put greater stress on the juvenile fish, and could reach lethal levels.

D. Socioeconomic Environment

1. Economic Impacts

a. Employment

Development of the 140-acre project site will increase employment directly in Washougal, and indirectly in the surrounding region as well. In addition to direct employment at the industrial park, jobs will be created by the personal spending of the workers and by the expenditures of the industrial firms for goods and services.

1) Direct Employment

The estimated numbers of temporary construction laborers and permanent workers that will be employed on the project site are shown in Figure 9 and Table 15. Some 40 workers will probably be needed over a 12-month period to build the roads, sewers, and other infrastructure.[12] Based on experience in the existing industrial park, constructing a typical building in the expansion might require an average of 20 workers over a 6-month period. The job density for permanent workers in the expanded industrial park was assumed to be the same as for the existing park (7.6 employees per acre).

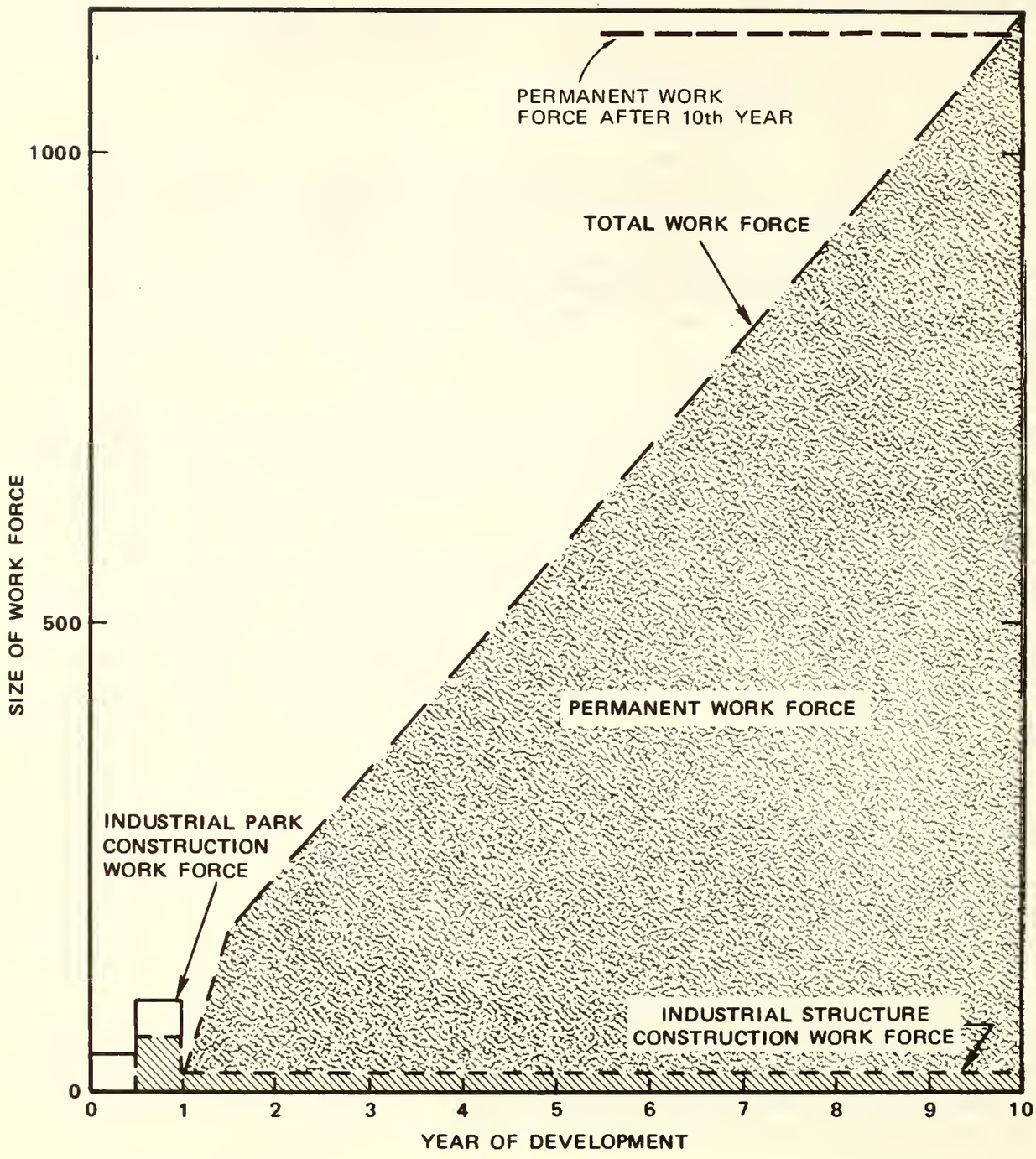

FIGURE 9. EMPLOYMENT PROJECTIONS

Table 15

PROJECTED DIRECT EMPLOYMENT FOR INDUSTRIAL PARK EXPANSION

Year	Gross Acres Developed		Average Number Employed			
				Permanent[a]		
	Incremental	Cumulative	Construction[b]	Incremental	Cumulative	Total
1	0	0	50	0	0	50
2	20	20	30	152	152	172
3	15	35	20	114	266	286
4	15	50	20	114	380	400
5	15	65	20	114	494	514
6	15	80	20	114	608	628
7	15	95	20	114	722	742
8	15	110	20	114	836	856
9	15	125	20	114	950	970
10	15	140	20	114	1,064	1,084
Full Development		779[c]				5,920
		1,203[d]				9,143

[a]Based on 7.6 employees per acre.[86]

[b]Based on 20 construction workers per structure, 2 structures for every 15 acres, and a 6-month construction period.

[c]Total remaining acreage (beyond the 140-acre expansion site) acreage that could be developed if all land within the 14-foot contour were preserved.

[d]Total remaining acreage that could be developed if no land were preserved.

The average total (gross) size of industrial lots in the existing park is 7.8 acres.[86] It was assumed that after the first year 15 acres will be developed each year, but that in the first year, after construction of the infrastructure, 20 acres will be developed because of the pent-up demand for industrial land. Consequently, about three buildings will be constructed during the first year, and an average of about two per year thereafter.

If all land in the project area were developed for industrial use, the additional employment would be between 5,900 and 9,100 (see Table 15). That range is also based on the present employee density. If development were to proceed at the rate of 15 acres per year, 50 to 80 years would be required to absorb the available land.

2) Secondary Employment

Secondary employment has two components: indirect employment and induced employment. Increased business for industries that supply goods and services to the industrial park firms, as well as for those that supply the suppliers, results in increased indirect employment. Induced employment results from increased payments (wages) to households and the resultant increases in personal consumption. The estimated amount of secondary employment created by the industrial park expansion is presented in Table 16.

Indirect employment is likely to be created throughout the Portland economic area, which includes five Washington counties and 18 Oregon counties (see Appendix E). However, the indirect employment will probably occur primarily in Portland, the industrial center of the economic area.

Induced employment will be created at those places where industrial park employees and indirect jobholders spend their incomes. A survey of current industrial park employees indicated that nearly 95% of the employees reside in the Camas, Washougal, or Vancouver areas (see Table 17 and Figure 10). Although the largest number live in Washougal, they are roughly equally distributed in these three areas. Therefore, the induced jobs will be concentrated in those places where the primary employees live and work, i.e., Camas, Washougal, and Vancouver.

More job opportunities at these locations will result in greater demands for housing and urban services primarily in these three cities and in Portland.

3) Total Employment

Table 18 shows the estimated percentage increase in the size of the Portland-Vancouver SMSA and Clark County labor forces attributable to the expansion. In each case the growth rate of the

Table 16

PROJECTED SECONDARY EMPLOYMENT FOR INDUSTRIAL PARK EXPANSION

Year	Direct Employment[a]	Secondary Employment[b]	Total Change In Employment[c]
1	50	107	157
2	172	370	542
3	286	614	900
4	400	858	1,258
5	514	1,103	1,617
6	628	1,348	1,976
7	742	1,592	2,334
8	856	1,837	2,693
9	970	2,082	3,052
10	1,084	2,327	3,411
Full Development	5,920	12,707	18,627
	9,143	19,623	28,766

Note: The regional employment multiplier (which equals 2.15) is derived by dividing column 3 by column 2.

[a]Source: Table 15.

[b](Total change in employment) - (direct employment) = secondary employment.

[c]Source: Table D-1.

Table 17

PLACE OF RESIDENCE OF EMPLOYEES IN THE EXISTING PORT OF CAMAS-WASHOUGAL INDUSTRIAL PARK

Place of Residence				
City and State	Zip Code	No. of Respondents[a]		Pct. of Total
Camas, WA	98607		108	29.2%
Washougal, WA	98671		126	34.0
Vancouver, WA	98660	8		
	98661	17		
	98662	21		
	98663	5	116	31.4
	98664	41		
	98665	15		
	unknown	9		
Other Washington				
Brush Prairie, WA	98606	6		
Battle Ground, WA	98604	3	11	3.0
Carson, WA[b]	98610	1		
Ridgefield, WA	98642	1		
Oregon				
Portland, OR	97203			
	97205			
	97215			
	97217	4		
Milwaukie, OR	97222	3	9	2.4
Beaverton, OR	97204	2		
Total			370	100.0%

[a]Total sample size (370) represents 87.3% of total employment (424).

[b]Skamania County.

Source: Reference 87.

SOURCE: Reference 48

Note: Oregon zip codes are not shown; only about 2.4% of employees live in Oregon

FIGURE 10. CLARK COUNTY ZIP CODES

Table 18

INDUSTRIAL PARK AND RELATED EMPLOYMENT
AS A PERCENTAGE OF PROJECTED SMSA AND COUNTY EMPLOYMENT

Development Year	Calendar Year	Portland SMSA Labor Force (1,000's)[a]	P.C-W.I.P.[b] and Related Employment In SMSA (1,000's)[c]	P.C-W.I.P. And Related Employment As Percentage of SMSA Labor Force
1	1979	491.2	0.16	-
2	1980	515.6	0.54	0.1
3	1981		0.90	
4	1982	530.9	1.26	0.2
5	1983		1.62	
6	1984	560.5	1 98	0.4
7	1985		2.33	
8	1986	581.7	2.69	0.5
9	1987		3.05	
10	1988	599.5	3.41	0.6

Development Year	Calendar Year	Clark County Labor Force (1,000's)[a]	P.C-W.I.P. 33% of Related Employment (1,000's)	P.C-W.I.P. 33% of Related Employment as Percentage of of Clark County Total Labor Force
1	1979	43.8	0.08	0.2
2	1980	47.3	0.29	0.6
3	1981		0.49	
4	1982	48.3	0.68	1.4
5	1983		0.88	
6	1984	50.9	1.07	2.1
7	1985		1.27	
8	1986	53.2	1.46	2.7
9	1987		1.66	
10	1988	55.2	1.85	3.4

[a] Medium projection source: Reference 45.

[b] Port of Camas-Washougal Industrial Park.

[c] Source: Table D-1 (For the purpose of this calculation it is assumed that all secondary employment would be located in the Portland-Vancouver SMSA).

labor force in and related to the industrial park is more rapid than either the SMSA or the County rates. At full occupancy, the employment at and related to the industrial park expansion will constitute about 0.6% of the SMSA's labor force and 3.4% of Clark County labor force.

Employment at the expansion site alone, at full occupancy, will increase the total projected employment of Camas and Washougal together by 74% and 21%, respectively. That will represent a significant broadening of employment in the Camas-Washougal area. Not only will more jobs be available for local residents, but the diversity of jobs will increase substantially. In 1977, Crown Zellerbach (about 2,500 employees) and Pendleton Woolen Mills (about 475 employees) accounted for an estimated 70% of local jobs. Thus, new businesses in the industrial park will provide a large number of job opportunities outside those two dominant industries, as well as a broader range of occupational opportunities.

4) Unemployment

Changes in unemployment rates cannot be forecast accurately. The typical firm locating in the industrial park will bring a certain number of technical and managerial personnel, and hire some workers from the local region. It is the hiring of the local workers, naturally, that would affect the prevailing unemployment rate. However, it cannot be predicted how many of the local residents hired will come off of the unemployment rolls (or vacate other jobs), thus permitting the unemployed to find work. Similarly, how many local workers at the expansion site will be new entrants to the labor force cannot determined in advance.

If, for the purpose of crude estimation, 50% of the industrial park and related jobs created each year are assumed to be filled by the unemployed, then in year 2, for example, the Clark County unemployment rate would be reduced by 0.2%* In each succeeding year the impact on annual unemployment would decline as the county labor force grew relative to the annual increase in industrial park workers, which is assumed to remain at the same constant number (refer to Table 19). Beyond the long-term effect on unemployment, the industrial park will help insulate the local economies against downward fluctuations in employment by the two dominant industries.

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*(((114 industrial park jobs per year) + (114 jobs) x (2.15 secondary jobs per industrial park job) x (0.33 secondary jobs in Clark County)) x (50% of all jobs filled out of ranks of unemployed)) ÷ (47,300 persons in labor force) = 0.2% change in unemployment rate.

b. Personal Income

In 1980, the second year of site development, the increase in personal income is estimated to be $4.1 million.* That assumes that 95% of the people employed at the industrial park and 33% of the secondary job holders reside in Clark County. Thus, in 1980, the personal income derived from the activities at the industrial park expansion site will amount to 0.5% of the total personal income in the county. In subsequent years, that proportion will increase to a maximum of perhaps 3%.

In 1976, the average annual wage or salary in the SMSA was $10,000, whereas the average annual income of employees in the industrial park was $11,400 (see Appendix D). If the average income in the expanded industrial park follows this trend, and if the people who locate in Clark County, Camas, and Washougal, are representative of that average, then the per capita personal income in those areas will rise relative to the SMSA and the nation.

2. Demographic Impacts

Increases in population in the Camas, Washougal, and Vancouver areas are estimated in Table 19. The location of population increases cannot be predicted accurately. Workers will seek housing near their places of employment, but they will locate where their particular needs are best met. It was assumed that the new workers at the industrial park, as well as 33% of the secondary jobholders, will reside in the same geographical pattern as the current employees.

At the end of the second year the population attributable to the expansion, as a percentage of projected population without it, will be 3.8% in Washougal, 2.2% in the Camas, and 0.3% in Vancouver. If the assumed distribution pattern prevails, the proportion of the population associated with the expansion will ultimately increase to substantial levels.

Without the industrial park expansion, population in Clark County is projected to grow by 2.1% per year between 1980 and 1985. If population related to the expansion were to increase according to the scenario illustrated in Table 19, the total growth rate would increase to about 2.6% per year. Thus, the expansion will be an added spur to population growth in a region already experiencing substantial growth.

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*($7.9 million total change in personal income x 0.49, fraction of direct and secondary workers assumed to reside in Clark County) x (167.10 ÷ 158.8, consumer price index adjustment to 1975 dollars) = $4.1 million.

Table 19

POPULATION CHANGE DUE TO INDUSTRIAL PARK EXPANSION

Development Year	Year[a]	Employment at Port Ind. Park	33% of Secondary Employment	Total Employment (Port and Secondary)	Population Increase[b]
1	1979	0	56	56	173
2	1980	152	122	274	847
3	1981	266	203	469	1,449
4	1982	380	283	663	2,049
5	1983	494	364	858	2,651
6	1984	608	445	1,053	3,254
7	1985	722	525	1,247	3,853
8	1986	836	606	1,442	4,456
9	1987	950	687	1,637	5,058
10	1988	1,064	768	1 852	5,723

		Washougal Area		Camas Area		Vancouver Area	
Development Year	Year	Population Increase[c]	Increase As a Pct. of Total Population[d]	Population Increase[e]	Increase As a Pct. of Total Population[d]	Population Increase[f]	Increase As a Pct. of Total Population[d]
1	1979	59		50		54	
2	1980	288	3.8	247	2.2	266	0.3
3	1981	493		423		455	
4	1982	697		598		643	
5	1983	901		774		832	
6	1984	1,106		950		1,022	
7	1985	1,310	16.0	1,125	8.1	1,210	1.3
8	1986	1,515		1,301		1,399	
9	1987	1,720		1,477		1,588	
10	1988	1,946	22.7	1,671	11 3	1,797	1.9

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[a] Assuming construction commences in 1979.

[b] Based on an average family size of 3.09.[89]

[c] 34.0% of total population increase; see Table 17.

[d] Refer to Table 11 for total projected population in area and geographic definition of area.

[e] 29.2% of total population increase; see Table 17.

[f] 31.4% of total population increase; see Table 17.

3. Housing Impacts

Housing vacancy rates are higher than desirable where the industrial park workers now reside (see Section III.D.1.). The number of units that could be occupied (as of June 1978) without driving the vacancy rate below what HUD considers healthy is calculated in Table 20. Those units number more than 2,500 in the Vancouver, Camas, and Washougal areas, and include more than 400 in the latter two areas.

The magnitude of housing demands cannot be predicted. However, given the present number of housing vacancies and the current growth rate, it is not likely that hardships will result from population influx related to secondary employment. Secondary employment will lag behind primary employment by several months, and will develop over the 10-year period of the project. Therefore, the market should have time to respond to the demands of these workers and their families.

During the last 6 months of the initial year of construction, the work force will average about 100 people. Because of the availability of construction contractors within 50 miles of the proposed expansion, construction workers will probably commute from their permanent residences rather than relocate near the site. Therefore, the housing market should not be affected by construction workers.

Housing demands of permanent workers during the first year of development probably can be met locally. Whether that would be the case over the longer run depends on future residential development in the area (at this time, continued expansion seems likely), the price and type of houses and apartments offered, and the demand created as a result of other factors (e.g., the completion of the I-205 bridge).

If the housing conditions were to remain static and industrial park workers sought homes according to the present pattern, there would be sufficient housing into the sixth year of development (excluding the demand of secondary workers). In fact, housing conditions will not remain static; southern Clark County is a high growth area. If the trends toward rapid expansion of the stocks of a variety of housing types continue, there should be sufficient housing to meet the demands of workers. When the I-205 crossing is completed in 1981 or 1982, the Portland region will be within reasonable commuting distance, thus further expanding the housing base.

4. Social Impacts

The people who will move into the Camas-Washougal area are expected to be demographically similar to the people already living there: primarily working-class families including many long-time residents retired from Crown Zellerbach and Pendleton Mills, and the newer, commuting residents, who tend to be skilled workers with greater income and more formal education. Most of the residents related to the expansion

Table 20

HOUSING AVAILABILITY IN SOUTHERN CLARK COUNTY[a]

Region (Zip Codes)	Housing Stock[b]			Vacant Units				
	Res	Apt	Tr	Res	Apt	Tr	For Sale[c]	For Rent[c]
Vancouver (98660-98665)	38,414	10,485	1,859	2,165	1,116	112	2,165	1,228
Camas (98607)	3,221	435	111	215	84	5	215	89
Washougal (98671)	2,377	502	106	178	51	16	178	67
Total	44,012	11,422	2,076	2,558	1,251	133	2,558	1,384

Region (Zip Codes)	Vacancy Rates						Units That Could Be Occupied Without Stressing Hsg Mkt.		
	Current		HUD Allowable Minimum		(Current)-HUD Minimum				
	Own	Rent	Own	Rent	Own	Rent	Own	Rent	Total
Vancouver (98660-98665)	5.6%	9.9%	1.0%	4.0%	4.6%	5.9%	1,767	728	2,495
Camas (98607)	6.7	16.3	1.0	4.0	5.7	12.3	184	67	251
Washougal (98671)	7.5	11.0	1.0	4.0	6.5	7.0	154	42	196
Total	5.8%	10.3%	1.0%	4.0%	4.8%	6.3%	2,112[d]	850[d]	2,962[d]

[a] All data for June 1978, unless noted otherwise (see Table 10).

[b] Res = residential, Apt = apartments, Tr = mobile homes.

[c] Assuming that the "residential" classification is equivalent to the ownership classification.

[d] May not add due to rounding of vacancy rates.

will be working-class, but the influx of higher skilled people also will continue, facilitated by completion of the I-205 bridge.

The Camas-Washougal area is currently undergoing changes because of its rapid population growth. The area has traditionally been oriented toward the paper and woolen mills. The original Port industrial park introduced the first significant industrial employment outside the mills. Expansion of the industrial park will continue that trend. Now, however, the Camas-Washougal area is also becoming a bedroom community because of the impending completion of the I-205 bridge.

Expansion will increase local employment opportunities in numbers as well as by type. The broadened industrial base will also stabilize the local economy, hedging against changes that would result from declines in employment at Crown Zellerbach and Pendleton.

As the cities grow, the commercial as well as residential bases also will expand, thus providing greater diversity in shopping and housing. As the major employers become less dominant, the political base of the community will broaden, and a greater diversity of lifestyles and values can be expected. In short, expansion of the industrial park will be a substantial influence in bringing about the changes that are to be expected with continued urbanization of the area.

5. Land Use Impacts

Except for eight lowlying acres in the northwestern corner, the project site will be converted entirely from open space to industrial use. Conversion of the project site to industrial use will not interfere with the current uses of the surrounding land -- industrial to the west and agricultural to the north and east. Beyond the pastureland to the north, SR 14 and the Burlington Northern Railroad provide additional buffer between the industrial park and the remainder of Washougal and its environs.

On the southern boundary, the dike provides a buffer between the industrial park and the recreational area at Cottonwood Beach. Effects on recreation and aesthetics are discussed later; potential biological effects were discussed in Section V.B.

Development of the project site will probably spur additional development in the project area. However, the success of this project does not depend on the likelihood of future development, and conversely, other areas within the dike could be developed without first developing the 140-acre site. Conversion of land in other parts of the country and city to accommodate new employees and their families probably will occur more rapidly.

6. Utilities

a. Water

Water for the industrial park expansion will be supplied by a 14-inch water line to be connected to a 14-inch line that now terminates at the southern end of 32nd Street.[3] The Port will construct the water lines and pay the City of Washougal 1.5¢ per square foot to cover the costs of capital improvements and additional sources to meet the water needs of the expanded industrial park.[52]

Although not directly related to the expansion, the Washougal Water System Facilities Plan[25] includes a 5-inch water line along the western edge of the sewage lagoon and crossing the wetlands into the existing industrial park. The purpose of the line is to provide a better loop system and improved fire flows.[52]

Projected water consumption for the Washougal water system in the year 2000 is 2.3 million gallons per day (gpd) for residential use, and 1 million gpd for industrial use -- a total of 3.3 million gpd, on the average, and a peak use of 10.2 million gpd.[25] The residential water use projection is based on a population of 16,000, which was based on the saturation residential density of the urban service area. The industrial water use projection is based on 660,000 gpd for the woolen mill (not in the existing industrial park), 10 industries using 20,000 gpd, and 20 industries using 10,000 gpd, with peak daily consumption of 3 times the daily average. These projections appear reasonable because the largest water users in the existing industrial park consume 10,000 to 20,000 gpd. With state approval, industries in the industrial park could also drill their own wells. Very heavy withdrawals of groundwater in that area, however, might affect the wetlands.

A total pumping capacity of approximately 8,400 gallons per minute (gpm) will be required to meet the expected water system demand of 7,200 gpm in the year 2000. This is approximately 4,800 gpm more than existing capacity. Construction of four wells at one site with a capacity of 1,200 gpm each has been recommended.[25] There appears to be no problem with the supply of water, and therefore no significant impact on the water system is anticipated due to expansion of the industrial park.

If an additional 500 acres (beyond the 140-acre project site) were developed for industrial park, with, say, 100 industries, each using 10,000 gpd, the added average water consumption would be 1 million gpd, or a peak use of 3 million gpd. The estimated additional population of 15,200 residents associated with the jobs on the 500 added acres would require 2.2 million gpd. The total additional water use associated with the 500 acres would then be 3.2 million gpd, or a peak consumption of 9.6 million gpd. This is an increase in the peak consumption of 94% over the currently-projected 10.2 million gpd. Applying that 94% to the projected 8,400 gpm required without the 500 acres yields a requirement of an additional 7,900 gpm of capacity, which

implies seven additional wells, each with a capacity of 1,200 gpm. In this case, a second doubling of water supply would be necessary.

b. Sewage

Sanitary sewer lines will be provided to collect domestic sewage from industries located on the project site. Earlier plans to transport the sewage over the wetlands via a force main have been revised. The force main now will be built on Port property to avoid crossing the wetlands and possibly damaging riparian and aquatic habitats. Sewer lines, manholes, and construction practice will conform to standards set by the Washington State American Public Works Association.[3]

By the terms of the Port's Development Standards[13] (see Section I.E.3), disposal of liquid industrial waste will not be permitted on the site or in adjacent drainage ditches, sloughs, or other waterways. Discharge of treated or untreated sewage or wastes into the sanitary sewer system (or the Columbia River) will have to conform with applicable codes, ordinances, and regulations, both state and federal.

The Port will install the sewer system and pay the City of Washougal a one-time charge of 2.5¢ per square foot of industrial land served by the sewer system to pay its share of the capital costs of the municipal sewage system.[52]

The Washougal Sewage Facility Plan projects an urban service area population of 16,000 by 1995, and waste loads of 100 gallons per person per day (gpd).[24] The projected total of 1.6 million gpd exceeds the 1 million gpd capacity of the sewage treatment plant with the current improvements, and by exceeding the 1 million gpd limit, would require a higher level of treatment. Thus, further expansion of capacity and improvement of the level of treatment will eventually be required, but the timing of such expansion has not been projected.

The capacity could be expanded somewhat by adding more aerators. The improved control of suspended solids that EPA rules would require if the flows exceeded 1 million gpd could be provided by adding a sand filter to remove algae. Because only about half of the 40-acre site is now being used, considerable modification and expansion of the present sewage lagoon could be made without infringing on the adjacent wetlands and flood impoundment area.[53]

The project site and most of the project area were included in the proposed ultimate urban service area for sewage and water service. However, the easternmost end of the area was not. If industrial development occurs in that area, the area probably would also be included in the Washougal urban service area because Washougal is the logical entity to provide services there.[52]

c. Storm Sewers

Catch basins will be located along the roadways in the industrial park to collect surface runoff. Storm water will be conveyed to the channelized portion of Gibbons Creek directly south of the sewage lagoon. Because the soil is of moderately slow permeability and poorly drained, most surface runoff now occurs by overland flow; therefore, negligible quantities of additional water are expected to flow through the storm sewers into the wetlands.[3]

The catch basins will contain oil traps to prevent petrochemical discharges into the wetlands and canal. The oil traps will be designed so that petrochemicals will float on the surface of the water in the catch basin. To be effective, the traps will have to be cleaned periodically. The oil traps will collect small quantities of oil washed off the streets and parking areas, but will not be able to cope with major spills. Petrochemicals released into the canal could be harmful to the vegetation and wildlife in the wetlands. The damage would be limited largely to the vicinity of the canal if the water were low, but would affect a larger area if the spill occurred when the water was high.

d. Electricity

The present overhead distribution line will be extended to serve the proposed expansion. Additional capacity is available by extending another line south into the project site, and still another distribution line and substation could be added if needed. The supply of electricity will not present a problem. The distribution lines and substation will be installed by the Clark County Public Utility District (PUD).[55] The Port will pay for the leads from the distribution lines.

Any additional lines into the industrial park or to industrial development on other land behind the dike probably would probably be planned to cross the wetlands. Construction of the lines would create some impact, and the lines and supporting structures would affect the appearance of the wetland area.

e. Natural Gas

The current available capacity of 7,000 cubic feet per hour (ft^3/hr) serving the industrial park can be increased readily to 90,000 ft^3/hr by replacing a short section of 2-inch main on East Second Street with 4-inch main. Because of the proximity of Northwest Pipeline's 20-inch transmission main, even greater volumes could be made available without major investment.[56]

Northwest Natural Gas Company will pay for the replacement of the 2-inch main on East Second Street and the extension of the company's 4-inch main in the present industrial park to the proposed

expansion. The Port will pay for the lines connecting the firms to the main.[56]

Northwest Natural Gas Company expects to have adequate gas supplies available to meet the expanded load. However, legislation before Congress may restrict the use of natural gas by industry.[56]

7. Public Services

a. Fire Protection

Fire protection requirements will be increased by both the expanded industrialized area and the associated residential development. About two-thirds of the population increase associated with the industrial park expansion is expected to locate in Camas and Washougal.

In Camas, to maintain the current level of protection in the face of projected population growth including the expansion, fire protection services must expand to cover a population increase of about 57% between 1978 and 1990. That compares with a 39% increase necessary over the same years to maintain current levels of protection for the population projected without the expansion. In Washougal, the population will expand about 48% rather than 16% between 1978 and 1988. These differences, which are especially significant compared to county-wide averages, show that considerable additional expansion of local fire protection services will be required as a result of the industrial park expansion.

The preceding analysis ignores the need or desirability of changing the level of protection in the future. Furthermore, geographic growth patterns may require facilities at new locations. For example, Washougal expects that expected growth to the north and east will necessitate a branch fire station with at least 3 men and no fewer than 2 pumper trucks.[14] Although much of the additional requirements will emerge in rural fire protection districts, as the area grows, rural regions may be annexed to either Camas or Washougal.

b. Police Services

Increased police services will be required as a result of the expansion, both to patrol the new industrial areas and to serve the law enforcement needs of the additional residential population. As with fire protection, police services must expand a significant additional amount (see above for qualitative estimates). Thus, the industrial park expansion will put a greater burden on the Clark County Sheriff's Department.

c. Schools

Population increases from the industrial park expansion ill lead to larger enrollments in the Camas, Washougal, Evergreen, and ancouver School Districts. Although the additional enrollments cannot e projected accurately, a good estimate can be made by using the ratio f students to all citizens in Clark County. This is done in Appendix , which contains data about the various school districts and details of his analysis.

Table 21 shows that because of the small size of of Camas nd Washougal relative to the greater Vancouver area, enrollment increases related to the proposed expansion will be a larger percentage of rojected enrollment in the Camas and Washougal districts than in the vergreen and Vancouver districts. To understand the significance of he increases, their effect on the districts' projected timetables for ew schools was examined.

Elementary, intermediate, and senior high schools have ifferent enrollment capacities. A new school is required when the otal number of students at a grade level exceeds the design capacity of xisting schools by enough students to fill 30% of a new school.[58] ounty projections[58] of new school needs for 1979 through 1988 indiate that (1) the Camas School District will require a new intermediate chool in 1984 according to either the low or high enrollment forecasts, nd an elementary school in 1989 according to the high forecast, and (2) he Washougal School District will need only one intermediate school in 979. The Evergreen and Vancouver School Districts will together reuire 14 elementary schools, 6 intermediate schools, and 3 high schools etween 1976 and 1990 (see Table 22).

Given the estimated expansion-related student increases see Appendix F), the industrial park expansion will result in the new chool requirements shown in Table 22 (Because changes in enrollments n the Evergreen and Vancouver School Districts are expected to be mall, it was assumed that the expansion will not have a perceptible ffect on the timing of new schools in those districts.) In general, he timing of required schools will be advanced to greater and greater egree as the project site approaches full occupancy. Similar advances n the timing of new school requirements would be expected if additional roject area land were industrialized later.

The enrollment increases will also put additional pressure n overcrowded and functionally deficient facilities. Another interediate school is currently needed in the Washougal School District to elieve its one overcrowded facility. As noted in Section III.D.5.C., ost of the district's facilities are inadequate for serving educational rogram needs now. The intermediate school in the Camas School District s overcrowded (though not yet sufficiently so to warrant an additional chool), and the high school is in poor condition.[58]

Table 21

PERCENTAGE INCREASE OF STUDENT ENROLLMENT WITH INDUSTRIAL PARK EXPANSION OVER PROJECTED ENROLLMENT

Year	Camas School District	Washougal School District[a]	Evergreen and Vancouver School Districts
1979	0.5/0.5	0.8	0.1/0.05
1980	2.7/2.6	3.9	0.2/0.2
1981	4.6/4.5	6.8	0.4/0.4
1982	6.5/6.3	9.2	0.6/0.5
1983	8.2/7.9	11 8	0.7/0.6
1984	9.7/9.3	13.5	0.8/0.7
1985	12.0/11.5	17.1	1.0/0.9
1986	13.4/12.9	18.5	1.1/1.0
1987	15.0/14.4	21 1	1.3/1.1
1988	16.7/16.0	23.5	1.3/1.2

[a]Only one enrollment forecast was made for the Washougal School District; both low and high forecasts were made for the other districts.

Sources: Baseline projected enrollments from Tables F-2 through F-4 in Appendix F. Port-related projected enrollments from Table F-5.

Table 22

TIMING OF NEW SCHOOL REQUIREMENTS
WITH AND WITHOUT INDUSTRIAL PARK EXPANSION

	Camas School District				Washougal School District	
	Low-Growth Forecast		High-Growth Forecast			
Year	Without Project	With Project	Without Project	With Project	Without Project	With Project
1979	-	-	-	-	I	I
1980	-	-	-	-	-	-
1981	-	-	-	-	-	-
1982	-	-	-	I	-	-
1983	-	I	-	-	-	-
1984	I	-	I	E	-	
1985	-	E	-	-	-	-
1986	-	-	-	-	-	-
1987	-	-	-	-	-	E
1988	-	-	-	-	-	-
1989	-	-	E	-	-	S
1990	-	-	-	-	-	-

E = Elementary School.
I = Intermediate School.
S = Senior High School.

Source: New school requirements are from Reference 58.

Expansion-related population increases will compete with school districts for land for future school sites. Residential and other development growth induced by the expansion probably will cause land prices to rise more quickly in the 1980s than they otherwise would. However, the increased costs of school sites may be balanced by increased tax revenue to the school districts in which the additional people reside.

d. Health Care Services

Over the next 15 years, hospitals and other health care facilities will need to expand to meet the needs of the growing population in the Washougal, Camas, and Vancouver areas. Additional population growth due to proposed expansion of the industrial park will obviously increase the demand for health care services.

An accurate projection of hospital use by the expansion-related population would require assumptions about the medical needs of those people relative to the needs of the Clark County population as a whole. Those assumptions would be so speculative that the results of the analysis would be unreliable and deceptively detailed. A rough estimate of the change in the use of health facilities can be made by assuming that:

- The number of hospital occupants is proportional to population.
- St. Joseph Hospital and Vancouver Memorial Hospital, which are members of the Southwest Washington Hospital Management Corporation, can be considered equivalent to one larger hospital.
- New hospital facilities will be required when the hospitals reach an average occupancy of 100%.

In 1976, the combined average occupancy of St. Joseph and Vancouver Memorial Hospitals was 66%.[59] Given the foregoing assumptions, the two hospitals will reach full occupancy when the Clark County population reaches 152% of the 1976 population, or about 230,000. Without expansion, this population will be reached in early 1996. With expansion, the same population will be reached in early 1995. Thus, the additional population growth resulting from the expansion may cause southwest Washington hospitals to advance their expansions by about one year.

The effect on the Veterans Administration Hospital was not estimated because the number of veterans moving into the area is not known. However, although the average occupancy rate of the Veterans Hospital is higher than the other two hospitals, changes in the veteran population using the hospital attributable to the industrial park expansion probably will be small.

e. Recreation

Development of the project site will not directly affect existing recreation. Indirectly, however, development might lower the quality of recreation at Cottonwood Beach by increasing noise and traffic. Construction equipment may be audible to people on Cottonwood Beach, but industrial operations and truck, rail, and auto traffic probably will not be disturbing, given the barrier effect of the dike and the Port's noise performance standards. Increased traffic along 32nd and Index Streets may cause problems in the area now used for parking for the beach. However, noise and commercial traffic will be less on weekends and holidays, when Cottonwood Beach is expected to be used most heavily. The Port's development standards will restrict building heights to 25 feet and the height of other structures to 40 feet (assuming no variances). The dike and the vegetation on the river side of the dike will probably shield most industrial park structures from view, thereby greatly reducing visual impact.

The additional residential population associated with the expansion will live in and around Camas, Washougal, and Vancouver, and use the parks and other recreational facilities provided by the cities and the county. If not expanded and augmented, the parks and recreation facilities may become overcrowded and inadequate to provide for the recreational needs of the additional residents. At the moment, for instance, Washougal recognizes a number of deficiencies in its recreational facilities.[14] Local governments could use some of the increased tax revenues they will receive from the new residents and new industries to purchase and maintain new parks and recreation facilities.

In the long term, if full development of the project area occurs, waterfowl hunting that now takes place with the permission of private land owners would be severely limited or eliminated altogether. Even if industrial development does not cover the entire project area (e.g., a greenway is retained), safety considerations would probably preclude hunting in the area.

The project area now offers potential recreation for hikers, picnickers, birdwatchers, and fishermen; however, because of private land ownership and agricultural activities, these recreational uses are not realized at present. Industrial development would eliminate future recreational opportunities to the extent that natural scenery and animal habitats were modified. Greenways or other areas left undeveloped could be used for recreation; however, surrounding industrial development would lower the aesthetic quality and possibly the recreational value of adjacent open space.

f. Social Services

Additional future requirements for social services created by the proposed expansion are more difficult to estimate than the requirements for other public services, because the recipients of social

services are specialized segments of the population, rather than the population as a whole. With industrial park expansion and the associated population increase, the needs for social services in the county will grow slightly faster than they would without the expansion. Given the expected increases in funds (which should follow from increases in the tax base) and time to plan for anticipated needs, the expansion should not adversely affect the provision of social services to the people of the Camas-Washougal area.

8. Transportation

Rail access into the area will require a connection to the rail line at the southwest corner of the BPA property.

Road access will be provided by connecting the end of Index Street at the southwest corner of the BPA property. The costs of the access road and the circulation roads within the industrial park will be paid for by the Port.

The existing accesses to SR 14 at 27th Street and 32nd Street will be adequate to serve the expanding industrial park for some time. But full development of the site will triple employment so improvements to the intersections, especially at 32nd Street, and to internal roads in the existing industrial park probably will be necessary. The increase in commute traffic on local city streets to the expanded industrial park could be significant. B and E Streets in Washougal, which might be most affected, now have traffic volumes of more than 5,000 vehicles per day.[52]

Development of the entire project area would require another access off SR 14. If another access were required, the Port would be expected to pay the costs of the access and the access road.[52]

9. Aesthetics

Impacts on aesthetics are changes in the character of an area that make it more or less pleasing to the senses of sight, hearing, and smell. Aesthetic impacts depend on the degree or magnitude of change, the uniqueness of the site, the number of people that can observe the site, and the character of the proposed development. Given the generally pastoral nature of the project area, increased development represents a major change in its aesthetic character.

However, as noted in Section III.D.4., the completely unscreened BPA storage yard already constitutes a major visual intrusion on the natural landscape. As additional portions of the area are converted from the natural state, the influence of any one additional action is reduced; therefore, all must be considered as a whole.

The Port's Standards of Development[13] are either identical to or more stringent than the City of Washougal's Comprehensive Zoning Ordinance. These design standards are comprehensive and well-directed. The Port's intention is ". . . to attract commercial and industrial users through reasonable standards and not to impose undue hardships to location of industrial and commercial activities." To this end, the standards have provision for variances. However, the Port may not permit variances that violate the Washougal zoning ordinance. The resolution further states: "A review of subjective design elements such as buildings, site layout, and landscaping will be carried out to ensure compliance with the intent of the Port to provide a quality development. Design will be reviewed with respect to compatibility to the surrounding development, use of indigenous materials, and functional efficiency." This goal is well-served by stipulating 60-foot setbacks for all buildings and 10-foot screen strips between any streets and parking facilities and along boundaries of industrial properties abutting residential or business zones. Building height limitations and requirements for the screening of rooftop utilities further assure aesthetic quality for the industrial park, as does the requirement for underground utility lines.

Provisions for maintenance and enforcement are also well-defined. Both are important to long-term aesthetic quality. The terms of leases and deeds require that any repairs be made within 30 days of written notice. If they are not, the Port is empowered to make such repairs itself and be reimbursed for its expenses. In the case of a tenant, the Port has a further option of terminating the lease for default. Legal sanctions are provided for the enforcement of standards, if necessary.

If variances are few, and the standards are strictly enforced, the expansion site will be considerably more attractive than the existing industrial park with its tidy but relatively unscreened industrial structures, which detract from the adjacent farmlands and wetlands, roadways, and hillside residential areas.

Although the screening requirements are quite sufficient for the industrial park itself and its immediate neighbors, they do not adequately address the visibility of the industrial park from hillside residential areas overlooking the site. At the least, loading and storage areas should have screening on all sides, rather than just the street sides.

The most acute impacts will be caused by construction. General site preparation will take about one year, but improvements to specific parcels and building construction will go on for about 10 years more or less continuously. During these specific activities, the area will be unattractive because of large construction equipment, supply stockpiles, open trenching, temporary buildings, and construction activity. If the barge terminal is built, pile driving will greatly increase the noise level. These impacts, however, are considered minimal because they will be of relatively short duration when they occur, and will no longer occur when full occupancy of the site is achieved.

When the expanded industrial park is fully occupied, a significant change in the character of the area will have taken place. Increased truck, car, and rail traffic, and the use of more industrial equipment will cause a general increase in noise level. The noise may not be considered unpleasant by people within the industrial park, but it probably will mask the subtle natural sounds of the adjacent, undeveloped areas (e.g., the sounds of birds and water). Emissions from greater traffic will add to odor and possibly reduce visibility in the area.

Should the barge terminal be constructed, barge traffic and loading and unloading would further contribute to the noise level. The barge terminal itself, and the river traffic it would generate, would impinge substantially on the aesthetic character of Cottonwood Beach. Further, improved access to the beach and installation of sanitary facilities will probably attract more people to the beach. People now using the beach may feel that the once-serene spot will have become less attractive.

10. Historical and Archaeological Sites

Neither of the two closest known sites is likely to be affected by the 140-acre expansion, or by development of the remainder of the project area. Further, because of the many construction and farming activities that have already taken place in the area, serious doubt exists about the integrity of any site which might be found.

However, because the area has not been thoroughly surveyed, and cultural material has been found in nearby sites, the opinion of the Washington State Office of Archaeology and Historic Preservation is that the "areas to be addressed in the EIS should be professionally surveyed for archaeological resources."[68]

VI MECHANISMS FOR MITIGATING ADVERSE IMPACTS

A. Erosion Control

Preventing or minimizing erosion is necessary to protect the wetlands and to preserve the runoff storage capacity (and the migratory fish runs, if they are reestablished). Erosion prevention measures include controlling surface runoff by berms or ditches, watering for dust control, constructing catchment basins, conserving topsoil for later revegetation, and minimizing removal of vegetation. After development, revegetation and landscaping help stabilize disturbed land. These erosion prevention measures can be required by the Port, as well as by the City of Washougal when permits for developing the project site are issued.

Development in the upper Gibbons Creek watershed, which may be accelerated by the industrial park expansion, may lead to erosion. To protect wetland and riparian habitats, monitoring and regulating development in the watershed will be necessary.

B. Geologic Hazards

Geologic and soil conditions at the project site present moderate seismic risk. The structural design of buildings should take these conditions into account.

C. Flood Prevention

Landfilling has reduced the area available for storing heavy runoff, but pumping capacity has not been increased to compensate. The project site is high enough to escape flooding from even severe storms. However, to protect portions of the existing industrial park which are at lower elevations, as well any future development at lower elevations in the project area, additional pumping capacity must be installed to handle storm runoff from Gibbons Creek and the project area.

D. Water Pollution Control

Storm runoff from impermeable surfaces constructed on the project site could contaminate lower Gibbons Creek and the associated wetlands. The drainage system planned for the project is inadequate for preventing such contamination. Project plans call for oil traps in the storm drain

catch basins to prevent gasoline and oil washed off the roads from entering the wetlands. Maintenance schedules for cleaning out these oil traps need to be clearly specified and followed to ensure their effectiveness.

Two additional measures could be taken to prevent damage to the wetlands from a major oil or chemical spill. One is to prohibit industries that use substantial quantities of petroleum products and chemicals from locating in the park, and to restrict vehicle fueling in the park. The other measure is to construct an emergency retention basin to trap any spills that do occur. The retention basin could be built near the point where the storm drain will leave the project site by forming an earth berm with a culvert and gate. In the event of a spill, the gate could be closed and the trapped materials removed before the water is released.

EDA intends to require that drainage control measures be constructed to protect the adjacent wetlands. Comments from agencies and individuals with relevant experience will be solicited.

E. Air Quality

Direct emissions from the industrial firms in the expanded industrial park can be limited by the Port's development standards (which limit occupancy to small and medium-sized industrial firms that meet certain performance standards), the Southwest Air Pollution Control Authority (SWAPCA) requirements for use of advanced air pollution control technology, and the SWAPCA authority to deny permission to locate in the industrial park if a firm's air pollutant emissions would be too high -- if these measures are rigorously applied. Given the status of the Portland-Vancouver metropolitan area as an Air Quality Maintenance Area for particulates, SO_2, CO, and NO_x, and the Vancouver area as a non-attainment area for particulates, CO, and NO_x, it is important that the preceding policies and regulations be applied to the industrial park expansion and associated development. Because industry is the principal source of particulates and SO_2, particular attention should be given to controlling sources of these pollutants.

The air pollution resulting in the designation of the Portland-Vancouver area as an Air Quality Maintenance Area is primarily auto-related. Therefore, pollutant emissions from traffic associated with the industrial park expansion could be mitigated by transportation control plans. Transportation control plans for the metropolitan area are now being developed; the Port, Clark County, and the City of Washougal should support and participate in their development and implementation.

In anticipation of what will be required in the long run to preserve acceptable air quality, these agencies should enact or encourage measures to reduce transportation energy consumption and traffic congestion. Energy consumption (by all users) is the primary source of most air pollutants, and traffic congestion tends to increase emissions by motor vehicles. Examples of measures to reduce energy consumption and

congestion are improved access, staggered work hours, and van pools. These measures will reduce emissions from the traffic directly related to the industrial park (i.e. commuting and truck traffic), but will have little effect on the larger emissions from the traffic associated with the general population increase that will result from the industrial park expansion.

F. Biological Conditions

1. Terrestrial and Wetland Habitats

a. 140-Acre Site

Disruption of the water sources for the wetlands and entry of pollutants into the natural water system should be minimized. The mitigation measures described in Section VI.D. would serve these goals.

Disturbance of wildlife in the wetlands can be reduced by creating a shelterbelt of trees and brush, 20-50 feet wide, along the northern perimeter of the project site. This shelterbelt would buffer wildlife from human activities, prevent substantial overland flows of water into the wetlands, and provide wildlife with food and shelter. EDA will require a shelterbelt as a condition of the grant offer.

The commitment of 2-5 acres of the 140-acre site or the purchase of additional land would be required. The shelterbelt should consist of natural species of trees, shrubs, grasses and forbs. Ornamental species should not be used because they produce little or no fruit. A meandering shelterbelt is preferable to a linear one because it should have the appearance of natural lines of vegetation; a manicured appearance should be avoided.

A shelterbelt along the eastern perimeter of the project site would also buffer the adjacent land from the expanded industrial park. However, eastward extension of roads and other infrastructure from the project site is, realistically, quite likely. Therefore, the ecological benefits of a shelterbelt along the eastern perimeter would be relatively short-lived: once the shelterbelt were pierced, it could not serve as a travel corridor between the wetlands and Cottonwood Beach and Reed Island, although it could continue to provide some shelter and enhance the industrial park aesthetically.

Continued eastward expansion of industrial development would interrupt the movement of animals between the project area and Cottonwood Beach and Reed Island. If the value of the wetlands as habitat for wildlife that move between the areas is to be protected, then a travel corridor may have to be preserved. This implies that development cannot be continuous along the river dike. Further studies would be needed to determine whether a shelterbelt/travel corridor would be essential, where it should be located, and the details of its design.

b. Wetlands

The primary goal in mitigating impacts on the wetlands is to retain as much water as possible in spring and summer. This could be achieved by modifying the pumping schedule. To be effective, water level control must be combined with reestablishment of native vegetation. Vegetation to be reestablished should consist of wetland plants (both aquatic and emergent), shrubby vegetation, and tall grass in a border at least 50 meters wide. Managing the wetlands for wildlife, which should be done by the Washington Department of Game, would enhance the value of the wetlands to wildlife. However, some large shy species may not use the wetlands to the extent that they currently do.

c. Full Development

As noted in Section V.C.1 the wetlands, grasslands, and woodlots would be severely affected by full development of the project area, and their value as habitat would be poor, if not nil. The value could be enhanced somewhat by managing the wetlands for wildlife, principally by reducing fluctuations in the water level and retaining as much water as possible during summer. However, the value of the wetlands probably could not be maintained at its current level because associated habitats would be lost, and because the wetlands alone are too small to provide the isolation needed by many species.

A more drastic measure would be to not commit all the land above the 14-foot contour in the project area to industrial development. The area lying between the dike and SR 14, from the north-south dirt road bisecting the project area to Lawton Creek and even further east (see Figure 3), could be managed exclusively for wildlife by the Washington Department of Game. This area contains the same habitats, and can readily be managed for wildlife of the same type and relative abundances, as occurs in the remainder of the project area. Management techniques are available to enhance the value of the habitats appreciably, and hence compensate partly for the loss of wildlife value incurred in converting land to industrial use.

Such a drastic mitigation measure would be necessary to preserve some meaningful wildlife values in the face of potential full development. Industrial development and other land-use practices tend to proceed on a piecemeal basis. No single increment requires drastic mitigation steps, but each action results in minor losses to wildlife. Taken together, such actions are generally substantial. In the case of full development, nearly total loss of wildlife resources would result. Moreover, conversion of the area to industrial use constitutes, for all practical purposes, an irreversible commitment of the land.

2. Aquatic Habitats

Restoration of migratory fish runs would compensate in part for reducing the wildlife value of the project area. If such restoration is attempted, the watershed should be protected from the effects of general development as well as from the industrial firms in the expanded industrial park. The major effect associated with developing any parcel of land is turbidity resulting from erosion caused by land-moving activities. Phasing development so that only a small amount of land is being prepared at any time would make erosion control easier and therefore would reduce the amount of material entering the stream at any time. Scheduling development so that each phase is completed before periods of expected heavy rainfall also would reduce the effect of turbidity. In addition, an undeveloped area (greenway) should be left around the stream bed. This will act as a sediment trap and should substantially reduce the amount of suspended particulate material entering from adjacent land.

Once a parcel has been developed, a major concern will be biologically active compounds in the runoff and industrial effluents. These substances can be toxic, act as a nutrient source for undesirable algae, or have a high chemical/biological oxygen demand. The nature of the effluents and runoff should be determined. If alternative disposal methods are not available, the material should be treated before it enters the creek. A greenway along the creek would act as a buffer by preventing runoff surges into the creek until the greenway soils are saturated.

G. Utility Extensions

The Washougal Water System Facility Plan includes a water line planned to cross the wetlands at the western side of the sewage lagoon. Similarly, expansion of electricity service might involve distribution lines crossing the wetlands. Such crossings are not a part of the proposed industrial park expansion but could be considered if the project area is developed extensively. To prevent damage to the wetlands, crossing the wetlands with utility lines should be avoided.

H. Public Services

Population growth induced by expansion of the industrial park will increase demands for public services, notably schools and fire and police protection. Problems in providing such services usually are due to communities not being prepared to provide the services when the need for them appears, either because they have not anticipated greater demand or because of insufficient funds. Public service problems usually are created or aggravated by rapid, sudden, or unexpected growth in demand. Potential problems can be mitigated by maintaining moderate growth rates, avoiding large changes in requirements, and advanced planning.

The City of Washougal, Clark County, and the Port have several means of influencing the pace of industrial park expansion and the associated population increase. The Port's 10-year plan for development of the expanded industrial park and occupancy by small and medium-sized firms, if followed, will help make growth a series of small but steady and predictable changes. The additional population to be expected as employment rises will require housing. If trends are monitored through their planning and building permit procedures, the city and county can anticipate the size and location of population increases and the resulting need for public services.

As the industrial base, employment, and related population grow, tax revenues will increase automatically. However, tax rates must be set to generate revenue sufficient to finance the necessary additional services, and budgets must include allocations for that purpose. Furthermore, some provisions for financing construction of facilities, such as schools and fire stations, before the new requirements appear may be necessary to have the facilities ready when they are needed.

I. Transportation

In later stages of the proposed expansion, and certainly for extensive development of the project area, traffic congestion in the vicinity of the industrial park is very likely. This expected congestion could be reduced by staggering work hours or by encouraging transportation alternatives to the automobile, such as van pools. Traffic controls and turn lanes may also be needed to expand the capacity of the access points from SR 14, minimize interference with traffic on SR 14, and reduce traffic hazards.

J. Aesthetics

Several measures would help mitigate adverse impacts on adjacent wetland and farmland. Strict application and enforcement of the Port's new development standards, particularly the screening and buffer zone requirements, would help preserve the ambiance of the farm and wetland areas. Applying the screening requirements for storage and loading areas to observation from all sides would also result in considerable improvement in the appearance of the park.

K. Archaeological Sites

To minimize the possibility that archaeological sites will be inadvertently damaged or destroyed, work should be halted if artifacts are uncovered during construction. Discoveries should be evaluated before development proceeds. EDA intends to place a condition to this effect on the grant offer. A professional archeologist might also be required to supervise construction if evidence is presented to EDA showing that

this action is warranted. Similar precautions should be taken for the remainder of the project area, if it is developed.

VII PROBABLE ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

A. Air Quality Impacts

Population growth associated with the industrial park expansion will result in an increase in auto traffic. Total auto-related air pollutant emissions will decline, but emissions nevertheless will be higher than would be the case without the expansion. If an additional 500 acres were developed, auto emissions would be approximately the same as at present, and substantially higher than would be the case without expansion.

Mitigation measures to reduce emissions from the traffic directly generated by the industrial park could have only a small effect on the total emissions from the added traffic in the area. Further, political considerations will probably limit the potential effectiveness of regional transportation control plans for reducing auto traffic. Therefore, auto emissions higher than would be the case without the expansion and the resulting poorer air quality are unavoidable.

B. Biological Impacts

1. 140-Acre Site

Probably no measurable unavoidable impacts will result from the proposed project. The composition of plant and animal communities on the 140-acre tract will change, but changes in wildlife population levels in the adjacent areas will, for the most part, be undetectable, because of the primitive state of wildlife ecology.

Some small resident animals will be displaced and probably will not survive. The movements of others across the industrial park will probably be restricted; however, the current extent of such movements and the extent of their curtailment after development are unknown.

Hydrocarbons and other chemicals may enter the wetlands, but their effects cannot be predicted without knowledge of the industries that will locate in the park. Construction of an emergency retention basin will reduce the probability of chemical pollution and possibly also eliminate the most severe episodes.

2. Full Development

Full development would result in major, unavoidable impacts. Without mitigating measures the area would become of negligible value to wildlife. Wintering waterfowl populations would be greatly reduced. Swans, geese and bald eagles would not use the area. Heavy human use of Cottonwood Beach and Reed Island, made possible by recreational improvements and perhaps operation of a barge terminal, would severely disrupt wildlife. The white-tailed deer population probably would disappear. Population levels of other animals would be greatly reduced, and some species would no longer occur in the area.

Although intensively managing the wetlands for wildlife would prevent their wildlife value from falling to zero, their present value nevertheless could probably not be maintained. Greater partial (but not complete) compensation could be obtained only by foregoing complete development of the project area.

The major unavoidable impact that would result from full development would be loss of the opportunity to use the land for the benefit of wildlife. Full development would irretrievably change the landscape and the wildlife resources of the area. Most of the low-lying land that has been diked off from the Columbia River in this region probably will be developed in a manner similar to the project site; much of the Portland region has already been developed. Thus, a continuing decrease in these types of habitats (wetlands, woodlots, and grasslands) along this reach of the Columbia River would occur. Although no single area is crucial to the welfare of wildlife resources, together they are all important. Thus, the development of the entire project area is a loss which cannot be mitigated.

C. Land Use Conversion

A direct consequence of meeting the objectives of the proposed industrial park expansion will be the conversion of agricultural land to industrial use. The agricultural value of the land will be irreversibly lost because restoration will be both very unlikely and very difficult once the land has been developed.

Development of the project site will also increase the probability that in the future adjacent land will be developed as well. Adjacent land will be more attractive once the convenient street and railroad system and utility connections on the project site have been constructed. Thus, carrying out the proposed project will unavoidably create pressure for additional development. The direction, extent, and nature of such development will be determined largely by the timeliness, comprehensiveness, and objectives of planning for the project area.

D. Aesthetic Impacts

The character of the 140 acres directly involved will be changed from pastureland to industrial park, with resulting change in the vista from the surrounding areas. Industrial development, even that employing the highest standards of design, landscaping, and maintenance, is rarely considered as aesthetically pleasing as natural landscape with farmland, wetland, and beaches. Consequently, the pleasing aesthetic character of the project area will be altered negatively.

VIII ALTERNATIVES TO THE PROPOSED ACTION

A. Introduction

The major environmental issues related to the proposed project are connected more to development of adjacent land rather than to the incremental effects of the 140-acre expansion alone. Further, by law, alternatives beyond the immediate authority of EDA must be considered. Consequently, the concept of alternatives was very broadly construed, and the alternatives considered included others besides EDA's immediate options. The rationale for this approach was also discussed in Section V.A.

Alternatives to the industrial park expansion, as it was proposed (including EDA financing), were initially taken to be:

(1) No further development

(2) Development at other locations in Clark County

(3) Development of other acreage behind the dike

(4) Project as proposed, without EDA funding.

These four courses of action are direct alternatives to the proposed expansion. However, given that the major environmental issues center on lands adjacent to the project site, the impacts of the alternative long-run strategies for developing the remainder of the project area are of concern. Therefore, four additional alternatives were defined to represent various strategies for developing the remainder of the project area:

(5) Development with greenway

(6) Development with wetlands reserve

(7) Development with flood protection reserve

(8) Development with creek realignment.

These alternatives differ from one another by the degree to which the current nonindustrial land uses are preserved, and the manner in which runoff from Gibbons Creek and the area behind the dike is accommodated.

In a sense, Alternatives 5-8 should be considered a subset of the proposed project. If the proposed project is carried out, any of these

alternatives could be implemented. That is, expansion of the industrial park is compatible with each of these alternatives. The choice of one (or more) of the alternatives depends on the degree and success of local and regional planning.

The eight alternatives are analyzed in the following sections. The four area development strategies (Alternatives 5-8) and their variations encompass all approaches mentioned in documents and public meetings concerning the proposed industrial park expansion, as well as others conceived during the impact analysis.

B. No Further Development

If further industrial development were not undertaken, then all impacts associated with development would be avoided. However, the beneficial economic effects that are the objective of the proposed project would not be obtained. In view of the need for a larger and more diversified industrial economic base and the supporting climate of opinion, foregoing future development is not practical.

C. Development at Other Locations in Clark County

In this alternative, industrial development would be directed to other sites within Clark County. The impacts of development in the project area would be exchanged for the impacts of development at other locations. Overall, these impacts may or may not be more severe than at the site now proposed, but they would certainly be different. The biological effects especially would differ, because no other potential industrial site is similarly located on or near wetlands.

The feasibility of this alternative depends on the availability and suitability of other industrial land in the county. A recent study[15] identified vacant industrial sites in Clark County, separating them into 18 districts. Only sites covered by a comprehensive plan and zoned industrial were included.

Most of the available industrial sites in Clark County are in or near Vancouver. They are likely to be developed whether or not the Port's industrial park is expanded because of their proximity to rail lines, major highways, and the Port of Vancouver. Costs of locating in these areas are considerably higher, however, and many smaller, newer firms might find them prohibitive. New industries around Vancouver would be within commuting distance of Camas and Washougal and would provide some jobs for people living in that area. However, they would contribute nothing to the Camas-Washougal tax base, and would generate little secondary employment for Camas and Washougal. Other sites in the northern portion of the county also would provide no economic benefit to the Camas-Washougal area.

None of the sites just discussed could be developed by the Port of Camas-Washougal. By law, it may operate only within a prescribed district, and none of these sites lies within its district.

Three of the 18 industrial districts, including the one in which the project site is located, are in the vicinity of Camas and Washougal. One consists of 248 acres on or across Camas Slough from Lady Island, and is wholly owned by Crown Zellerbach. The parcel consists of seven pieces separated by other developed areas. Each is considered to have possible archaeological significance. One has access problems, another is cut in two by SR 14, and a third is periodically flooded because it is lower than the sewer lines. Thus, the parcels do not provide a suitable alternative to the project site.

The second district has three small parcels totalling 35 acres. The largest (24 acres) is owned by Columbia Rock Products, which operates gravel pits there. A 5-acre parcel is in two separate sections; one is partially occupied by apartments, and the other is under development. The third amounts to only six acres. Thus, this district cannot substitute for the project site.

Land in the third district lies in the vicinity of the dike, and is discussed in the next subsection.

A recent report[90] revealed that only 46 acres out of 8,753 acres of potential industrial land in Clark County could be developed immediately -- that is, without making additional improvements such as roads, and sewer and water line extensions. About 617 acres have only a few deficiencies. Nevertheless, other land in the county probably cannot be prepared quickly enough to satisfy demand for industrial land in southeastern Clark County.

D. Development of Other Acreage Behind the Dike

Developing a different parcel of land behind the dike would yield the economic benefits of additional jobs, an expanded tax base, and secondary employment. However, various problems, disadvantages, and impacts combine to make all of these alternative parcels less attractive than the proposed site. Furthermore, if a different parcel were developed as a substitute, future demand for industrial land might well cause later conversion of the protected site, and others anyway. In contrast to the compactness of the currently planned expansion, an inefficient checkerboard pattern of development could result if another parcel were developed. In the long run, full development of the project area would be similar to that following development of the proposed project site.

In the EIS it prepared for the Port,[3] Parametrix, Inc., evaluated eight alternative locations for expansion in the vicinity of the dike (see Figure 11). The evaluations are quoted here in their entirety.

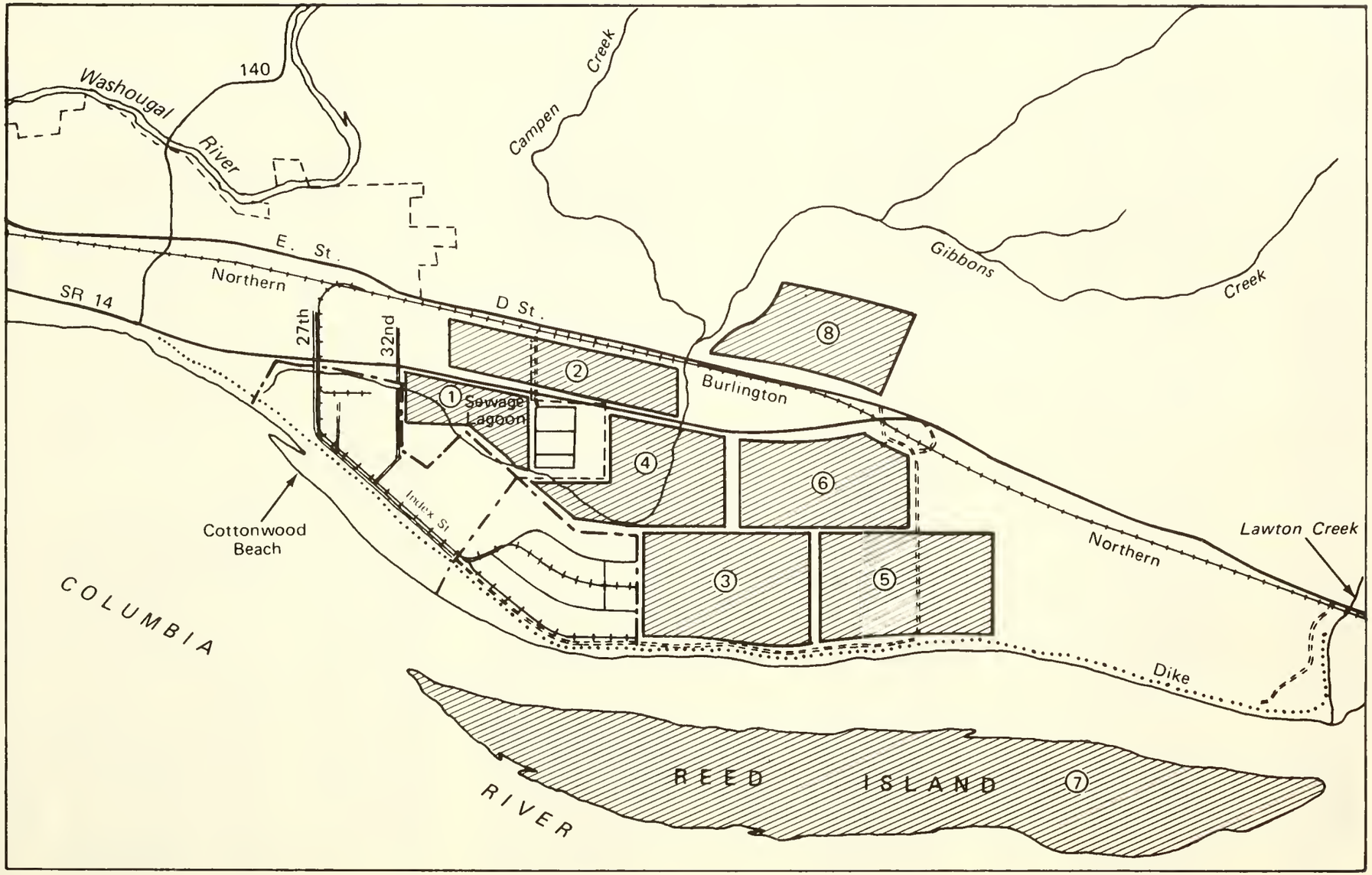

FIGURE 11. ALTERNATIVE SITES CONSIDERED BY THE PORT

1. Area 1

"A 63-acre tract of land north of the Bonneville Power Administration property and formerly owned by the Port was available for development. This area would have satisfied immediate demands of the Port of Camas-Washougal for industrial park expansion; however, the disadvantage to this alternative was that this 63-acre tract is almost entirely wetlands and the development of the area would severely damage the aquatic ecosystem associated with Steigerwald Lake. The 63-acre tract was thus maintained in wetlands use as a part of the transactions to acquire the 140-acre project site."

2. Area 2

"This area would provide a good location for industrial expansion. The adverse impacts upon wildlife would not be as severe as those associated with the project location. Convenient access to transportation facilities and utilities is available. The primary disadvantage to industrial site development in this area is that the area is privately owned and planned for residential development. Proximity to residential development and noncompliance with the Washougal Comprehensive Plan were also reasons for rejection of this alternative."

3. Areas 3 and 5

"Both of these tracts of land would provide the necessary industrial acreage. The adverse impacts would be very similar to those associated with development in the existing tract. The major reason for rejection of these alternatives was the excessive cost of servicing these areas with transportation facilities and utilities."

4. Areas 4 and 6

"These areas offer excellent industrial sites due to proximity to SR 14 and Burlington Northern Railroad. Development, however, would involve fill of and subsequent destruction of wetlands. These alternatives were rejected because it was felt that the adverse impacts associated with the destruction of these wetlands was excessive."

5. Area 7

"Connecting the existing industrial park to Reed Island and expansion into the Reed Island area was considered as an alternative to the proposed project site. The primary advantage of establishing an industrial park on Reed Island would be the availability of convenient access to water transportation. This alternative was rejected because it would (1) destroy a valuable wildlife habitat, (2) involve considerable landfill, and (3) conflict with the land use plans of the owner, Washington State Parks and Recreation Commission, to preserve the island as a state park."

6. Area 8

"This upland area was considered as an alternative to the proposed project site. The primary advantage would be it would accommodate expansion without infringement upon the Columbia River lowlands. Another advantage is proximity to transportation facilities. The primary disadvantage is the hilly terrain in which the area rests. Considerable excavation would be required to make the area suitable for industrial park development. This area has excellent potential for residential development due to the panoramic view provided by the Columbia River lowlands, and proximity to SR 14."

The feasibility of locating the industrial park expansion within the preceding areas was investigated before the proposed site was purchased. The proposed site was preferred because development there would conform to land use plans, because landfill would not be required, and because utilities and transportation facilities would be convenient to extend. Simultaneously, no wetlands would be destroyed directly.

E. Project As Proposed, Without EDA Funding

The Port has indicated its intention to develop the project site whether or not EDA grants the funds requested by the Port.[2] Therefore, EDA funding is expected primarily to affect the timing of impacts; that is, development would be accelerated by EDA funding. Without EDA support, it would be more difficult initially for the Port to prepare sites for prospective occupants. If early phases of the development were successful, the preparation of additional parcels probably would become more tractable financially. In addition, without EDA funding, the Port could not be made subject to federal stipulations designed to mitigate or to compensate for impacts, or in general to protect the environment.

The impacts of this alternative would be essentially the same as those projected for the project as proposed (see Section V). Because development would be stretched out, the proposed project plan might be modified. But the essential difference in impacts between an EDA-funded project and one carried out without EDA funds would be the timing of the impacts. The potential long-range effects from ultimate development of the project area also would be very nearly the same.

F. Development with Greenway

Including a greenway in the project area represents a strategy of minimal conservation of open space. A relatively narrow strip of land along Gibbons Creek, including the drainage canal, would be left undeveloped (see Figure 12). The proposed expansion would be compatible with such an approach. Presumably, in the long run, all other land in the project area would be put to industrial use.

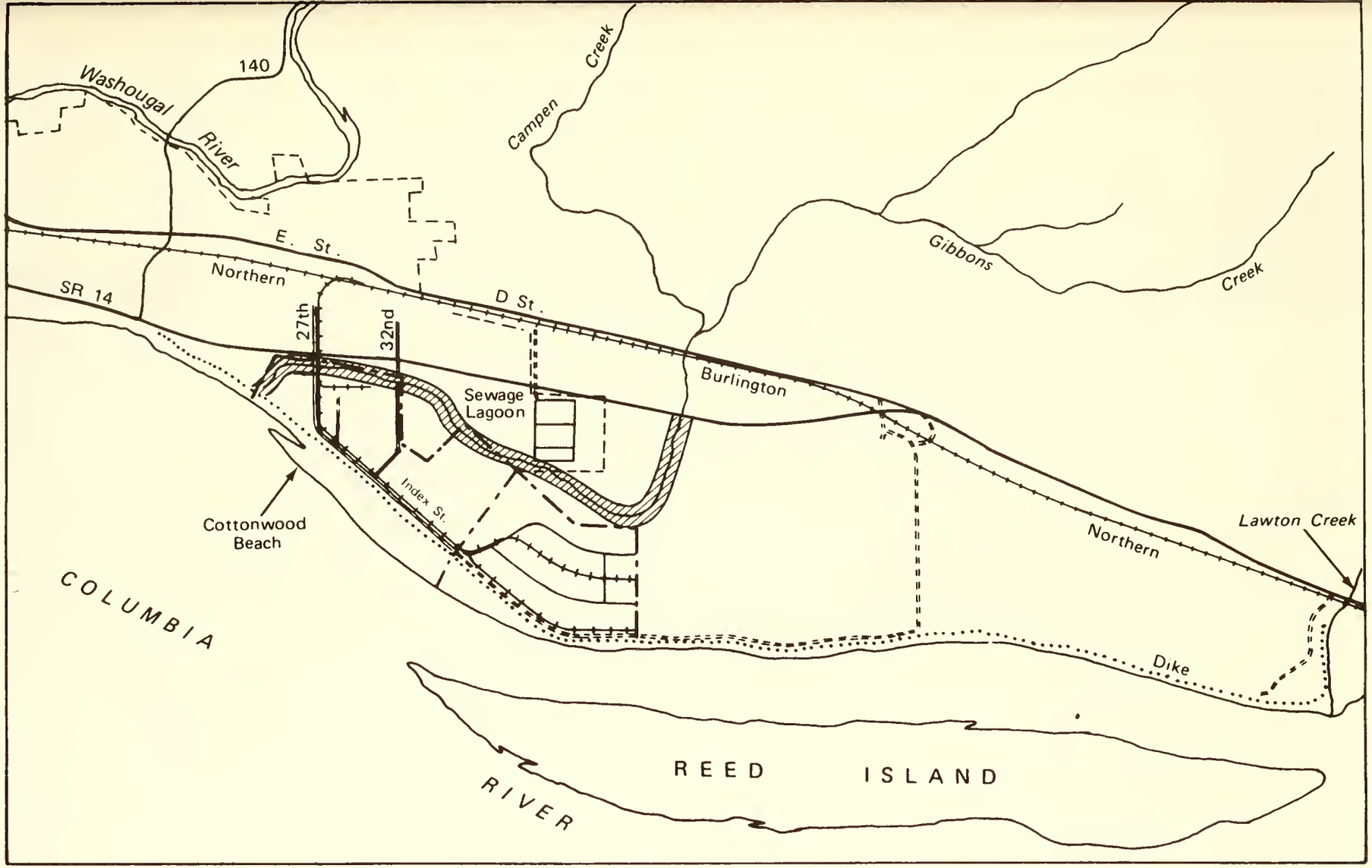

FIGURE 12. GREENWAY ALTERNATIVE

The preservation of a greenway is called for in the Parks, Recreation, and Open Space Element of the Washougal Comprehensive Plan.[14] The Port supports this plan in principle.[91] In the comprehensive plan, greenways, greenbelts, and natural areas are described as follows:

> The extent and location of lands designated for open space greenways or natural areas are determined by natural features such as waterways, slopes, ravines and swamps. Greenways require minimum facilities usually including trails, bikeways, nature study areas and landscape improvements. Greenways and natural areas need not be totally accessible to the public; they can be largely an open system tying together parks and access (i.e., scenic easements, agriculture, open space).[14]

This description suggests that measures to enhance the aesthetics and recreational potential of the Gibbons Creek greenway probably would be taken. Installation and operation of a new fish passage would be consistent. However, measures to enhance the wildlife habitat probably would not be taken, because a narrow greenway would not provide much suitable habitat. Similarly, protecting the greenway by such measures as controlling runoff from adjacent uplands might not be worthwhile. However, if a fish passage were reestablished, runoff control to minimize pollution would be necessary.

The land contained in the greenway could amount to as little as 20 acres for a greenway 100 feet wide. This alternative therefore involves virtually complete industrial development of the project area. This alternative is essentially the same as the "full development" case in Section V, except that there the discussion of biological impacts presumed that the wetlands would be preserved. However, because the wetlands alone are only marginally viable as a wildlife habitat, protecting a smaller amount of land implies similar, but more severe impacts. Practically speaking, development of any more land than that in the "full development" case would be tantamount to complete loss of the wetlands. Therefore, the impacts of this alternative are the same or more severe than those of the "full development" case in Section V.

G. Development with Wetlands Reserve

In addition to a greenway, areas that are actually or potentially wetlands would be preserved in open space in this alternative. Measures for protecting and enhancing the areas would be taken.

This alternative has two basic variations (see Figure 13). The first would preserve only areas west of the point at which Gibbons Creek enters the project area. There is an apparent consensus that most of this area consists of wetlands. Figure 13 shows an example of this variation including all land between SR 14 and the existing and expanded industrial park. Although not all of this land may be wetlands in the strictest sense, the amount of land between the wetlands and SR 14 may be too small to make industrial development practical.

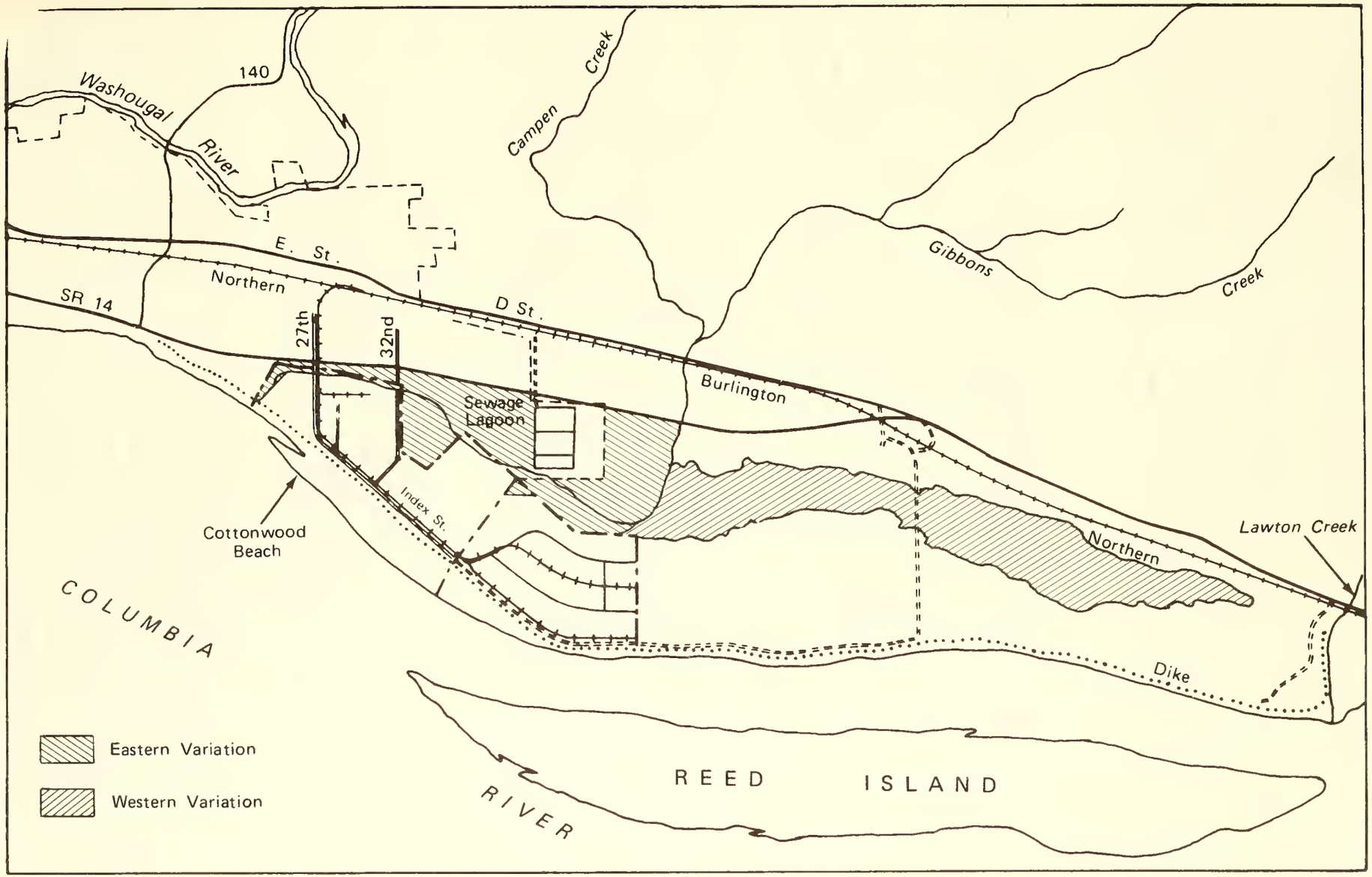

FIGURE 13. WETLANDS RESERVE ALTERNATIVES

The second variation would preserve land east of the creek entrance as well. There is no doubt that much of the eastern area was once wetlands. However, over the years the wetlands have been drained, and accumulated runoff from the Gibbons Creek watershed rapidly pumped out. Consequently, very little wetlands remain. On the other hand, historical wetlands, which have the greatest potential for restoration, could be considered for inclusion in this alternative. Figure 13 illustrates this variation by showing the extent of the wetlands arbitarily as the 14-foot contour. The basis for using this contour is explained in Section III.B.2.c.

One consideration in determining the area of actual and potential wetlands for inclusion is that to be valuable for wildlife, the wetlands must be large enough to provide a suitable habitat. The area within the 14-foot contour would be insufficient to maintain the present value of the wetlands, even with intensive management practices (see Section V.C.1.b.). Another consideration is that Executive Order 11990 includes potential as well as existing wetlands in the area to be considered when developmental impacts are assessed.[26] This obligates EDA to consider impacts to potential wetlands located east of the Gibbons Creek entrance to the project area.

Development of the project area with a wetlands reserve would have hydrological benefits because wetlands tend to be found at lower elevations. Therefore, areas preserved as wetlands would also provide storage area for heavy runoff from Gibbons Creek and reduce the pumping requirement for drainage control. However, to preserve the wetlands, the pumping schedule would have to be keyed to maintaining the habitat -- for example, by minimizing fluctuations -- rather than to draining all captured runoff as rapidly as possible. In particular, the storage area could not be drained dry or to low levels without endangering the habitat.

Implementing this alternative would require a thorough survey and evaluation of the project area, an effort which should be undertaken by an interdisciplinary ecological team. Because the Corps of Engineers and EPA have explicit federal responsibilities with respect to wetlands, the survey and evaluation should be carried out by, or in conjunction with, one or both of these organizations.

For the case of "full development" discussed in Section V, it was assumed that the wetlands would not be developed. Therefore, the impacts of this wetlands alternative are the same as the impacts of the proposed expansion project with "full development" of the project area. The viability of a reserve under this alternative is marginal; for wildlife to survive, they will need the water level controlled and will require nearby feeding areas. With the installation and operation of the proper facilities and implementation of protective measures, the migratory fish runs in Gibbons Creek could be restored.

H. Development with Flood Protection Reserve

This alternative is based on the use of low land in the project area primarily to store excessive runoff from Gibbons Creek (see Figure 14). Currently, the runoff storage capacity as originally designed has been compromised by filling of land below the 14-foot contour. For example, flood waters would rise to the 17-foot contour if a 50-year storm occurred in the watershed (see Section V.A.2).

The land area involved in this alternative would depend on the tradeoff made between storage and pumping capacities. The least acreage would be required if drainage requirements were met as much as possible by pumping. The most acreage would be required if only current pumping capacity were used, with storage provided for the remainder of the drainage requirements.

This broad range probably could be reduced substantially by engineering and cost considerations. Technical constraints are set by the current drainage canal and pumping facilities. Also, building and operating pumping capacity is costly. For example, the additional pumping capacity required to restore the design level of flood protection has been estimated to cost $85,000 (in 1977 dollars) to install.[4]

To restore the design level of flood protection without installing additional pumping capacity would require the land roughly within the 15-foot contour to provide sufficient storage capacity. An additional margin in elevation (e.g., one foot) might be desirable for safety. The area required for storage would increase by about 40 acres per foot of elevation[4] above the estimated 420 acres within the 14-foot contour (see Section III.B.2.c.). For example, there are approximately 460 acres within the 15-foot contour. If protection against a 5-day, 50-year storm were desired, the area roughly within the 17-foot contour, which is about 540 acres, would be required for runoff storage (assuming no additional pumping capacity).

The tradeoff would require that the the following factors be considered: the value of the land in industrial use, its value in use for agriculture and wetlands, the cost of installing and operating additional pumping capacity, the cost of developing the land, and the potential flood damages. An important consideration in making the tradeoff is the federal policy stated in Executive Order 11988 on Floodplain Management.[95] This order directs all federal agencies to "avoid direct and indirect support of floodplain development wherever there is a practicable alternative." The purpose of this policy is "to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains."

This policy applies to any action by federal agencies that "encourages, allows, serves, or otherwise facilitates" floodplain development.[96] Consequently, federal approval or funding of public or private activities that support development within the 100-year floodplain will be

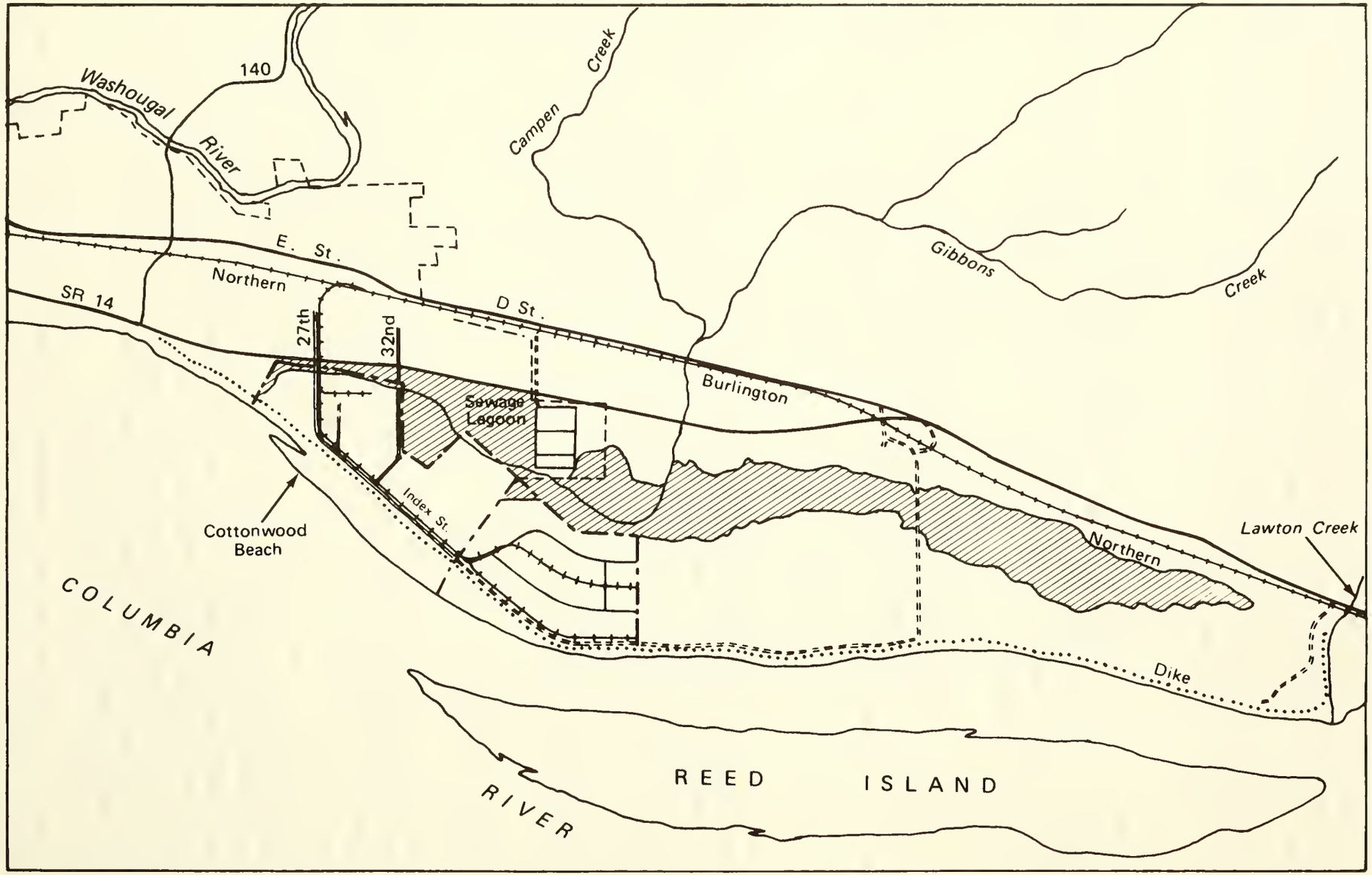

FIGURE 14. FLOOD PROTECTION RESERVE ALTERNATIVE

scrutinized and perhaps withheld, if practicable alternatives exist. By doing so, the federal government will attempt to prevent encroachment of development on floodplains and to promote non-structural approaches to preventing flood damages.

Available information on the 100-year floodplain in the project area is incomplete. However, Table 13 can be used for a rough estimate. A 100-year storm lasting 5 days would flood the project area to an elevation of 18 feet, assuming pumping capacity remains the same. This contour encompasses about 580 acres. Inadequate knowledge of current topography of the area precludes identifying the location of this floodplain.

It was noted in Section III.B.2 c. that the existing wetlands lie within the 14-foot contour. Therefore, the flood protection reserve alternative could have preservation of wetlands as a secondary objective. In fact, a substantial amount of potential wetlands could be restored or created. Alternatively, some upland habitats could be maintained for their wildlife value. However, as discussed above in the wetlands reserve alternative, drainage pumping would have to be subordinated to maintenance of the habitat. Regulating drainage pumping for habitat protection might simultaneously reduce the required pumping capacity.

The impacts of this alternative would be similar to those of the wetlands preserve alternative. But land held out from development for flood protection would also be available to serve as wetlands or feeding areas. Thus, if relatively more storage capacity were employed, the flood protection reserve alternative could provide more land for wildlife habitat than the wetlands reserve alternative.

I. Development with Creek Realignment

This alternative would involve restoration of Gibbons Creek to direct flow to the Columbia River (see Figure 15). Breaching of the flood control dike along the river would be necessary. In one variant, peak flows of the creek would be diverted via a channel to the river. In its report to EDA,[4] Parametrix, Inc., evaluated this alternative, labeled the Gibbons Creek Bypass. The bypass would divert Gibbons Creek so that it would flow by gravity to the Columbia River. The most economical design would divert the creek just south of SR 14 into an open channel and then to a pipe passing through the dike.

The preliminary evaluation estimated the cost of the bypass design at $694,000, and concluded that it was not economically feasible. Because runoff below SR 14 and seepage through the dike must be removed, the design would not eliminate the requirements for some pumping and storage capacity.

The bypass would divert only peak creek flows. Consequently, normal flows would enter the low areas used as storage behind the dike. However, if heavy creek runoff coincided with a 10-year flood or some

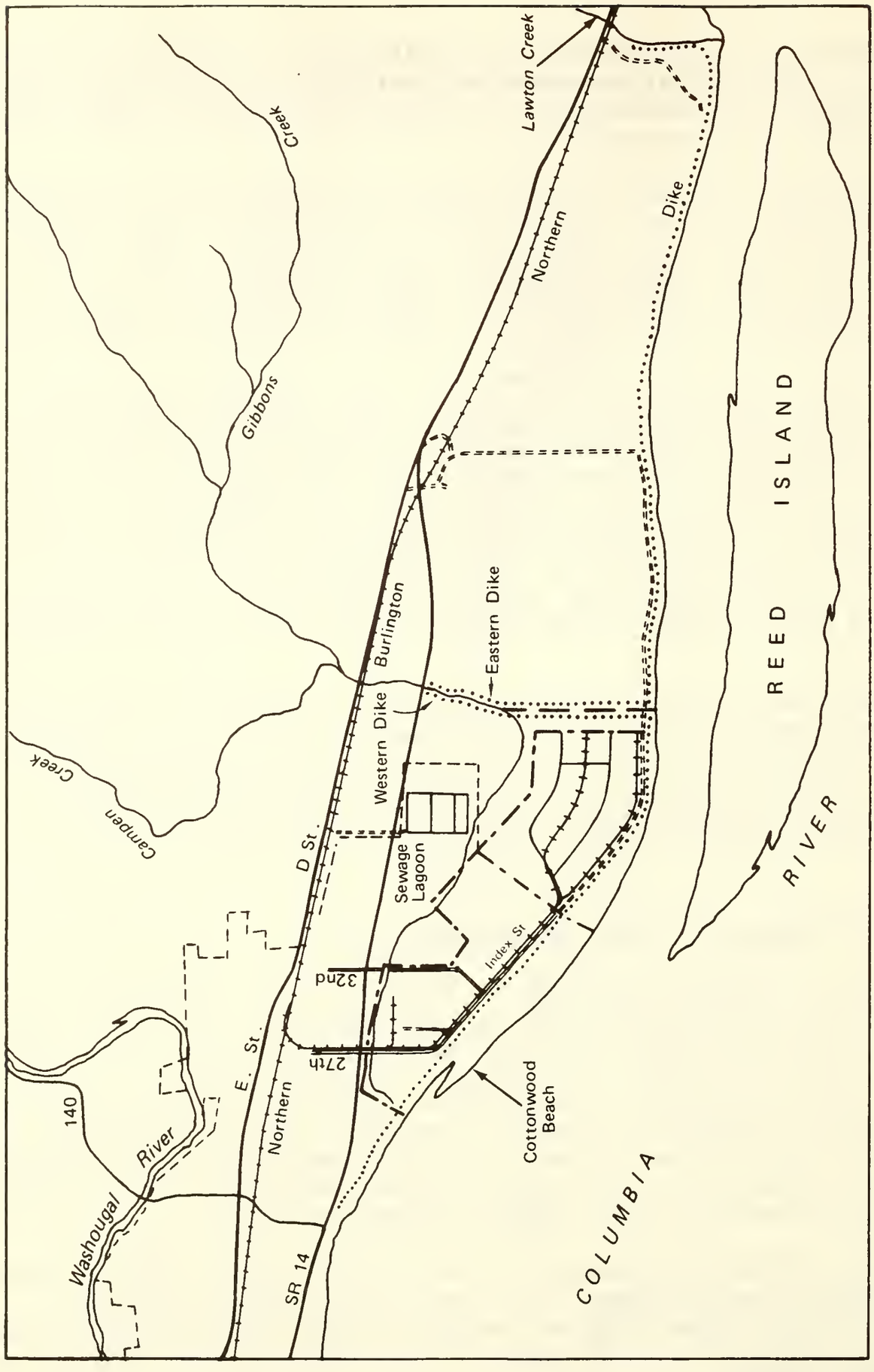

FIGURE 15. GIBBONS CREEK REALIGNMENT ALTERNATIVES

higher stage of the Columbia, unusually large amounts of water would enter the project area, possibly flooding present or future development.

Because the bypass design would still normally allow the creek to flow into the project area, some pumping and storage would still be necessary. But once provided, more extensive development than in the flood protection or wetlands alternatives would be possible. On the other hand, normal flows of the creek would be inadequate to maintain any meaningful area of wetlands. If the area west of the bypass were partially isolated by routing runoff in excess of the bypass capacity to the eastern area, the western area could be more intensively developed.

Use of a bypass would virtually preclude the possibility of reestablishing a fish run since flows through the pipe would be considerable and only for a short duration, making it difficult for adult fish to enter. Historically, there also have been problems associated with migratory fish passing successfully through long pipes. In addition, juvenile fish would have no direct river access except during the relatively short period of high flows.

A second variant, constructing a dike along the western bank of Gibbons Creek and breaching the river dike, would reestablish a natural outflow (though not the original). Pumping requirements would be greatly reduced, and fish runs could be reestablished. On the other hand, land to the east would no longer be protected from floods. About 30% of that area would be flooded annually by the Columbia River, perhaps 60% in a 10-year flood.[4] Thus, industrial development would not be possible, and agricultural use would be difficult.

If dikes were constructed on both sides on the creek, and the river dike breached (a third variation of the basic alternative), the maximum amount of land could be protected from flooding. Again, pumping requirements would be reduced, and fish runs could be reestablished. Although the area between the dikes could be made relatively large, it probably could not be made large enough to provide a viable wetland habitat without sacrificing a substantial amount of potentially developable land.

From a fisheries point of view, breaching the river dike would be desirable because fish would have direct access to the river at all times. If either of these variants were implemented, the new channel would have to be formed with care. Plantings would have to be made along the banks to reduce erosion and the gradient selected to permit suitable water depth during the summer months in order to maximize juvenile survival.

Neither of the second two variants of this alternative have been analyzed in the depth sufficient to understand fully either their feasibility or their economic and environmental consequences. This information would be needed for informed consideration of this alternative in any planning for the project area.

J. Comparison of the Alternatives

1. Discussion

a. Direct Alternatives

Of the four courses of action that are direct alternatives to the proposed expansion of the existing industrial park, none offer similar benefits with lesser environmental impacts. Foregoing all future development is not practical (see Section VIII.B.). Contiguous land in the quantity needed and for which planning is as advanced does not appear to be available at other locations in Clark County (see Section VIII.C.). All other parcels of land in the project area are less attractive than the project site because of various problems, disadvantages, and impacts (see Section VIII.D.). Finally, denial of the Port's applications for grants would probably only delay the occurrence of impacts because of the Port's intention to continue development with or without EDA funds (see Section VIII.E.).

b. Development Strategies

Carrying out the proposed action will raise the likelihood that the adjacent land will be developed. Each of the four additional alternatives, which are strategies for developing the project area, is compatible with carrying out the proposed expansion. That is, none is precluded if the proposed expansion proceeds. They differ primarily in the manner in which runoff from the Gibbons Creek watershed and the project area is handled and the degree to which current nonindustrial land uses are preserved (see Sections VIII.F. through VIII.I.).

1) Flood Control

In the greenway alternative, control of flood waters from Gibbons Creek would be achieved as it is now -- i.e., as a combination of pumping and storage. The optimal combination would probably emphasize pumping capacity and rapid drainage in order to maximize the amount of developable land.

In the wetlands reserve alternative, certain land (probably at least that within the 14-foot contour) would be preserved as wetlands and would be available for flood storage. This availability of storage capacity would probably move the optimal flood control strategy toward relatively more storage capacity. In addition, the pumping schedule would be subordinated to the needs of the wildlife habitat rather than be designed to drain the storage area as rapidly as possible.

The focus is on choosing the economically optimal combination of flood control in the flood protection reserve alternative. Optimality would be based primarily if not solely on economic considerations. More so in this alternative than in others, the federal

policy on floodplain management would have to be considered, especially as it relates to selection of the design storm for flood control analysis and to adoption of the policy and its objective of non-structural approaches to risk and damage reduction, with their implications for development.

The creek realignment alternative would route Gibbons Creek directly to the Columbia River. Pumping requirements would be greatly reduced, but not eliminated. (However, in one variant of this alternative, storage requirements would effectively be satisfied by opening the eastern portion of the project area to flooding by the Columbia River and the creek.)

2) Wetlands and Wildlife

The area set aside in the wetlands reserve alternative would be marginally valuable as wildlife habitat if it included only the land within the 14-foot contour. For this alternative, it would be necessary to decide the extent of actual wetlands, and the amount of uplands (to serve as associated wildlife habitats) and potential wetlands to include in the preserved area. (The chance of maintaining or enhancing the value of the wetlands in the long run would also have to be examined carefully.) As an example of one point of reference, if no additional pumping capacity were installed (i.e., the design flood control requirements were met only by additional storage capacity), the wetlands reserve would include the land below about 16 feet, assuming one foot of elevation as a contingency.

Because the existing wetlands alone are marginally viable, the greenway alternative would be incapable of preserving any significant wetland values.

In the flood protection reserve alternative, the optimal combination of pumping and storage capacities could involve a substantial amount of wetlands. In fact, it is possible that even more land would be potentially available for wetlands and uplands than in the wetlands reserve alternative. For example, if the 100-year floodplain were the basis for protection, the available land would correspond to the area within the 18-foot contour. An important condition to receiving the wetland benefits from this alternative is that the pumping schedule be determined to the maximum possible extent by wildlife needs.

The variations of the creek realignment alternatives (see Section VIII.I.) have quite different implications for wetlands: the bypass design would allow most of the existing wetlands to be filled, but a dike along the western bank of the creek would open all land to the east to flooding and potentially create a large expanse of wetlands. The two-dike variant falls between these two extremes, of course, but the potential area of wetlands is probably less than the minimal amount required for long-term viability.

3) Fisheries

In all alternatives except the bypass variation of the creek realignment alternative, migratory fish runs could be reestablished in Gibbons Creek. To do this would require at least the measures outlined in Section III.C.2.c. The nature of the bypass design would preclude the possibility of reestablishing a fish run in this variant (see Section VIII.I.).

4) Developable Land

The project area contains about 1,500 acres. With allowances for the existing industrial park, the sewage treatment plant, and the expansion site, there are about 1,200 acres of potentially developable land. In the following discussion of land requirements for flood protection and wetlands reserves, possible impediments to development which would further reduce the 1,200 acre figure are not considered.

The greenway alternative would involve the commitment of about 20 acres to open space (see Section VIII.F.). The land placed in a wetlands reserve could amount to as little as 65 acres, or consist of the 420 acres within the 14-foot contour. If the design flood control requirements were met only by additional storage capacity, the land within about the 16-foot contour (about 500 acres) would be set aside.

In the flood protection reserve alternative, the optimality analysis would probably indicate a storage area very close to the area within the 14-foot contour (420 acres). If the land within the 18-foot contour were used to protect against a 100-year storm (a more stringent criterion than in the original design, and consistent with the new federal floodplain policy), about 580 acres would be involved.

The creek realignment alternative has not been studied sufficiently to develop areal estimates as good as those for the preceding cases. However, the bypass and two-dike variations probably would involve about the same amount of land as the greenway alternative -- roughly 20 acres, but probably more, perhaps as much as 100 acres, especially for the two-dike variation. The one-dike variation would open between 250 and 900 acres to flooding by the Columbia River, effectively removing them from development.

2. Environmentally Preferred Alternative

a. Basis of Preference

After extensive analysis and deliberation EDA has concluded that the proposed industrial park expansion is environmentally acceptable when linked to a combination of the flood protection and wetlands reserve alternatives. The unavoidable, adverse impacts of the

proposed project are not so significant as to indicate that it should not be carried out. On the other hand, it is clear that the proposed project, and hence EDA funding of it, will have a strong influence on the future development of the project area. It is important that all social, economic, and environmental values be given adequate consideration before development has proceeded beyond the point at which conditions become irreversible.

EDA's decision was based on the desire to comply with the federal floodplain and wetland policies contained in recent Executive Orders while promoting beneficial economic development in the Camas-Washougal area. The combination of alternatives was selected because both flood protection and wetlands protection and enhancement goals could be served simultaneously. Such as combination meets the intent of the executive orders

EDA was also guided by the fact that the combined alternatives serve several goals of the City of Washougal as stated in its Comprehensive Plan:[14]

- "To encourage a pattern of urban settlement which is in concert with the land's capacity to accommodate human activities, avoids natural hazard areas and preserves unique areas." (Natural Resource Goal Number 2)

- "Encourage the orderly development of areas which are environmentally suitable for development. . . ." (Land Use Policy Number 2B)

Clark County has an Urban Lands goal which is virtually identical to the above Washougal Natural Resources Goal, and therefore is similarly served. Furthermore, the county has also defined preservation areas, which include natural hazard areas (e.g., 100-year floodplains), ecologically sensitive areas (e.g., wetlands), scenic views and sites, and fish and wildlife habitats. Goals for these areas are:[22]

1. Encourage the preservation of open space, scenic views and sites, historic and archaeological sites.

2. Encourage and maintain important fish and wildlife habitats.

3. Protect water courses, drainage systems and the natural hydrologic cycle.

4. Maintain ecologically "sensitive areas" such as natural areas, wetlands and excessive slopes in as natural a state as possible.

These goals are supported by specific guidelines,[22] including:

- Alternatives affecting water courses and natural drainage channels should be limited.

- o In planning for floodplain areas, uses that will not require protection through dams, dikes, landfills or levees should be preferred over uses that will require such protection.

- o Identify natural hazard areas and control development in these areas to prevent damage, loss or destruction of life and property.

- o Areas identified as unsuitable for development by reason of soil, geology or other natural or man-made hazards should be retained in open space and/or similar uses.

b. Elements of the Alternative

The principal elements of the flood protection/wetlands reserve alternative which must be addressed if the alternative is carried out are the wetland areas defined for protection, the analysis of flood protection requirements and the means to meet them, the melding of the preceding two analyses, and the financial and institutional arrangements to implement this alternative.

1) Wetlands Area

The area of wetlands and possibly uplands to be protected must be determined. This would require an interdisciplinary ecological team to determine the locations of existing wetlands by first-hand inspection of vegetation and soil conditions. Areas with high potential for creation or restoration of wetlands would also be identified. In addition to this work, avian and mammalian wildlife would be carefully surveyed to determine species composition and populations of the project area more accurately and to help identify habitat requirements. The foregoing information would be combined to specify the options concerning the area of wetlands to be set aside.

2) Pumping and Flood Storage Capacities

To give proper attention to flood control, flood protection requirements must be determined, and the pumping/storage options defined. The first step would be to decide the basis for the analysis -- either the original design flood protection requirements, the 100-year floodplain, or some intermediate requirement. Then, the tradeoffs between pumping and storage can be investigated sytematically, considering the factors itemized in Section VIII.I.

3) Synthesis

Information from the preceding two steps would be combined to arrive at the flood storage area and the wetlands area to be

protected. A complete set of mitigation measures, including those mentioned in Sections V and VIII, would be identified and described. Restoration of the migratory fish runs could be included as a measure to mitigate (by partial compensation) and to enhance the natural environment.

3. Financial and Institutional Arrangements

The flood protection/wetlands reserve alternative would require a carefully designed program devised cooperatively with and involving all parties with interests or responsibilities in the project area. Agreements to take or prohibit certain actions would need to be worked out.

The financial features of the alternative are represented in part by the costs of building and operating drainage pumping capacity, the value of the land in various uses, potential flood damages, and other factors named in Section VIII.I. Cost considerations of flood control and protection may dominate the economic picture because the wetlands reserve area generally is smaller than the area required for flood protection.

Nevertheless, a financially practical approach is usually the biggest issue in protecting wetlands. The three basic approaches are acquisition, financial incentives, and regulation. A successful approach would probably combine features of all of them.

a. Acquisition

Wetlands could be purchased by the Port or the City of Washougal, separately or jointly. Such purchase would be financed by issuing revenue or general obligation bonds or by the Land and Water Conservation Fund (on a matching basis) or by both. Other possible but less likely sources of funds are programs administered by the State of Washington.

b. Financial Incentives

The basis of this approach is to induce property owners to keep wetlands undeveloped. In this category are preferential tax treatment and payments (e.g., from the Agricultural Stabilization and Conservation Service) for land put in open space uses. Other incentives from tax benefits include donating development rights to a foundation or selling the land to a foundation for a minimal amount and donating the difference between the sales price and the market value to the foundation. The Western States Parks Foundation has been established to receive tax-free donations of land or development rights for the purpose of maintaining recreational and wildlife properties in their natural state.

c. Regulation

Regulation involves actions by federal, state, or local governments to control activities for the general public health and welfare. For example, local governments have the power to zone land within their jurisdiction. In the project area, agencies which will or could influence the location and nature of development in fulfilling their responsibilities include the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the Washington Department of Ecology, the Regional Planning Council, the City of Washougal, and the Port of Camas-Washougal.

IX RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The principal long-term goal of the proposed project is to increase industrial employment and diversify the economic base of the Camas-Washougal area. Achieving this goal will yield benefits to the two communities, their residents, and residents of the surrounding area. Increased personal and corporate expenditures will stimulate business activity, and increased tax revenues will permit expanded and improved government and public services, such as education. These largely economic benefits, both direct and indirect, will be realized immediately, over the 10-year development period of the proposed project, and beyond.

On the other hand, over the life of the project, the negative effects of the construction will be felt, although they will be limited mostly to within the project area. Adverse impacts on transportation and air quality will gradually increase. The character of the project area will be further changed as industrial activity replaces open space and agricultural uses, and the visual appeal of the area will probably decline in the eyes of most viewers. The agricultural value of the project site will be lost and, practically speaking, will not be recoverable.

Carrying out the proposed project will make additional development in adjacent areas of the project area more attractive and more likely. Thus, wildlife productivity, which probably will not be significantly affected by the proposed project itself, will be endangered in the long-run. Restoring the migratory fish runs in Gibbons Creek would enhance the long-term productivity of the local environment. It also would compensate in part for the loss of wildlife value that would occur if the land adjacent to the proposed site were fully developed. The ultimate long-term impacts will depend on the extent to which planning for future development of the project area considers environmental objectives and constraints.

X IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION

The proposed expansion of the Port of Camas-Washougal Industrial Park will require land, money, materials, and fuels. The commitment of fuels will be irreversible and irretrievable. Materials, for the most part, will be irretrievably committed until such time as recovery of resources from solid wastes is practiced on a larger scale. Most of the money to be invested in the project also will be irreversibly and irretrievably committed. However, there will be financial returns to individuals and the communities. Furthermore, a portion of the money will be invested as a loan, which will be paid off with future Port revenues. This money will be returned to the State of Washington for reinvestment in other economic development projects.

Practically speaking, the land on which the proposed expansion will be constructed will be irreversibly and irretrievably committed because of the difficulty of removing buildings and other improvements, and of restoring its current agricultural productivity. Land needed to accommodate the residences of new employees will be similarly committed, but the specific land is not identifiable in advance. Clark County and the City of Washougal will have the opportunity to plan for residential (and other) development, and thereby control the resources that are to be committed.

Although completion of the proposed project will turn attention to adjacent portions of the project area, no land other than the project site itself will be irreversibly and irretrievably committed by this project. Whether substantial commitments of wildlife resources are made depends on what long-range development objectives are adopted.

APPENDIX A

WILDLIFE HABITAT ASSESSMENT*

The approach to assessing wildlife habitats was to evaluate the quality or value of wildlife habitat and to predict the likely changes in value resulting from the proposed action. No attempt was made to generate a complete species list, nor to determine population levels. The basic assumption was that the welfare of wildlife resources is directly related to the quality of habitat, and that assessment of habitat quality, in conjunction with information on selected qualitative aspects of the wildlife communities, provides a basis for evaluting wildlife resources. Thus, the approach was community-oriented rather than species or population-oriented.

Habitat quality was ranked from 1 (poor) to 10 (excellent) considering the variety of species, disruption of habitat by human or natural causes, and the ability of populations to inhabit the area permanently (i.e., stability of populations). Generally, the following conditions are associated with high quality habitats: a large variety of species; populations resilient to temporary fluctuations in biotic and abiotic factors; and an absence of drastic, unseasonal disturbance. The present condition and the potential quality of each habitat was assessed. The latter is important because development activities have greatly reduced the quality of some habitats, and because the habitats could be restored to their original quality with little difficulty. Similar habitats in northwestern Oregon and southwestern Washington were used for comparison.

Overall, quantitative data on wildlife populations inhabiting the project area were rather meager. Available information consisted of observations by the Vancouver Audubon Society, qualitative assessments by the Washington Department of Game regarding furbearers and foxes, and inventories of floodplain habitats outside the dike.

The data on birds, which cover selected winter marsh bird populations, provide a reliable index of the abundance of many marsh birds, but emphasize birds that are conspicuous because of their large size or flocking behavior. For instance, among the waterfowl, green-winged teal were not recorded, although they undoubtedly were present. Also, the data were collected from a vehicle

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*See Section III.C.

on SR 14 from which much of the project area is not readily visible. Despite these faults, an impressive number of birds was observed. The data present a reliable index of the species that could be observed and are adequate for establishing the quality of the wetland habitat during winter.

The only other data available were the qualitative assessments of furbearers and foxes made by the Washington Department of Game. These data provide insight into the quality of the habitat but do not provide a solid basis for making judgments.

No data were available on wildlife populations during summer. Only qualitative assessment of the value of the habitat during summer, gained by several visits to the site, discussions with other wildlife biologists, and past experience in similar areas, was possible.

With the available information, it was possible to assess the quality of the habitat and likely impacts on that quality as a result of the proposed industrial park expansion (see Table A-1). However, for only a few species could quantitative impacts be predicted.

Data collected on the wildlife resources of Cottonwood Beach and Reed Island were available in the Inventory of Riparian Habitats along the Columbia River (Reference 33).

Table A-1

RELATIVE VALUES OF WILDLIFE HABITATS AT VARIOUS STAGES OF DEVELOPMENT, PORT OF CAMAS-WASHOUGAL, WASHINGTON

(Values rated on a 10-point scale: 10 = highest and 0 = lowest)

Area	Potential	Present	With 140-Acre Industrial Park Expansion	With Full Development
Mainland Site				
Grassland	8	4	3	0
Woodlot	8	5	5	0
Marsh				
Summer	8	3	2	1
Winter	9	7	6	2
Cottonwood Beach	9	8	7	5
Reed Island	9	9	8	6

APPENDIX B

ESTIMATION OF SURFACE RUNOFF*

To estimate surface runoff into the project area, it was assumed that the time of concentration is short (1 hour) and that the soil is saturated. Because major storms occur in winter months, 1, 2, 3, and 5-day winter storms were examined. A simple estimation procedure developed by the Soil Conservation Service was used, as follows:

$$R_i = k_i P_i$$

where R_i is the runoff from the i^{th} area, k_i is the runoff coefficient, and P_i is the precipitation in the i^{th} area. Total precipitation was obtained from the precipitation frequency curves shown in Figure B-1. The runoff coefficients were based on a U.S. Army Corps of Engineers study conducted from 1969 to 1972 in the Scappoose Drainage Basin in Columbia County, Oregon (see Table B-1). The coefficients are measures of terrain, vegetative coverage, moisture, and relative storm intensity. Comparisons of these coefficients with standard values for similar terrains indicate that the coefficients are high. The total volume of runoff for the two watersheds was calculated using the following equation:

$$R = \sum_i R_i = \sum_i k_i P_i .$$

Currently, three high-head vertical mixed flow pumps are installed in the pump station at the mouth of Gibbons Creek. Pump capacity varies with the total "head" it must work against. Head depends on the elevation of the Columbia River with respect to the elevation of Gibbons Creek and on flow losses within the pumps and associated piping. The maximum pumping rate corresponds to the smallest head, while the minimum pumping rate corresponds to the largest head. For high river stages, the smallest head occurs when the creek is also high. Each pump is capable of discharging 34,000 gpm at a total dynamic head of 15 feet, and 10,000 gpm at a total dynamic head of 36 feet. Therefore, the total discharge rate for the three pumps can range from a high of 102,000 gpm to a low of 60,000 gpm.

The relationship between the volume of surface runoff (the storage requirement) and the elevation of floodwater in the project area

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*See Section V.B.2

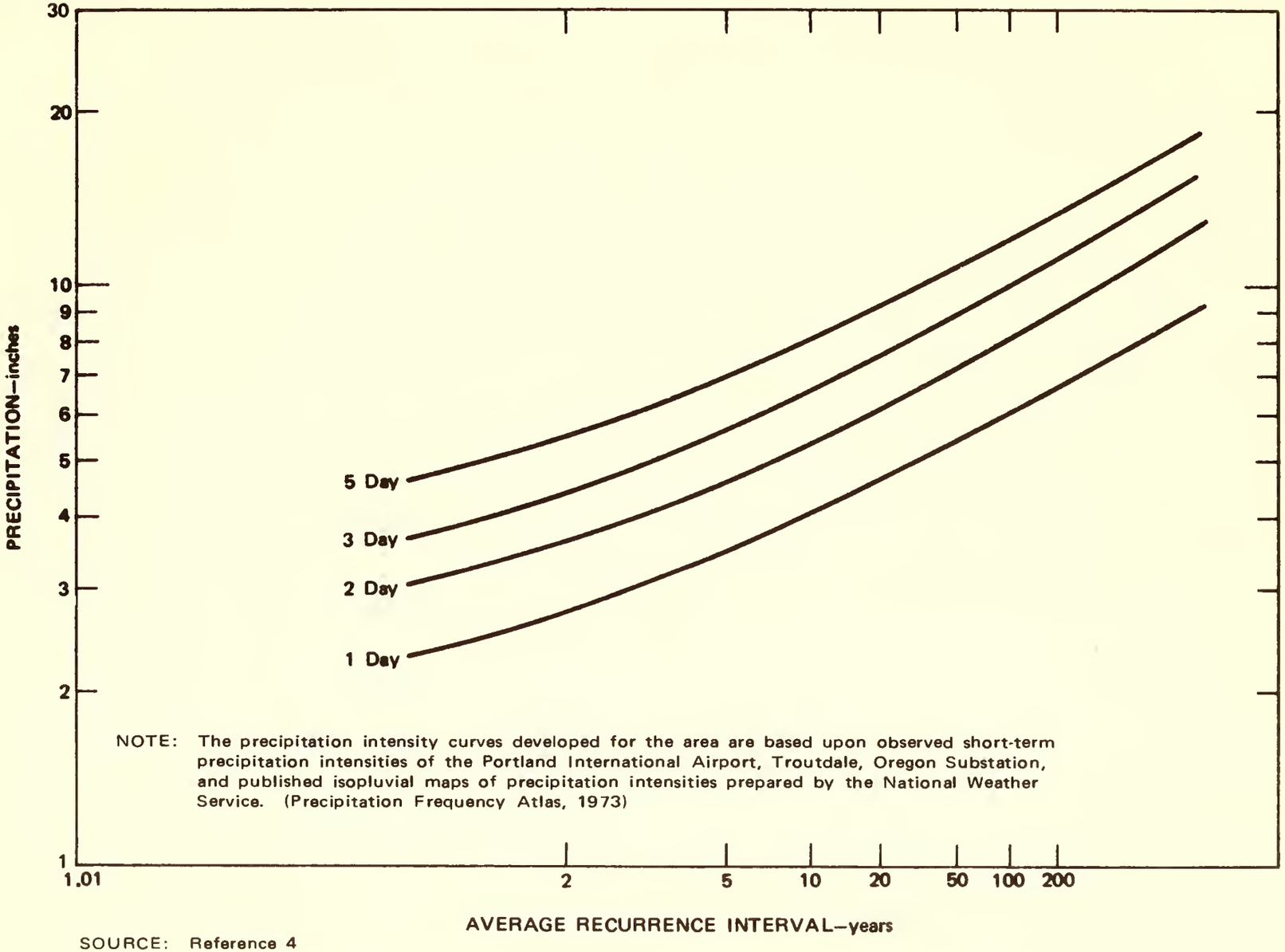
was extrapolated from the curve shown in Figure B-2, which is based on an evaluation of the available storage in Steigerwald Lake in July 1976. Storage has not changed appreciably since then, so the curve is still applicable.

Table B-1

RUNOFF COEFFICIENTS

Storm Frequency of Occurrence	Coefficient of Runoff (Pct)	
	Hilly Terrain	Diked Area
5-year	60	40
10-year	65	45
20-year	70	50
50-year	75	55
100-year	80	80

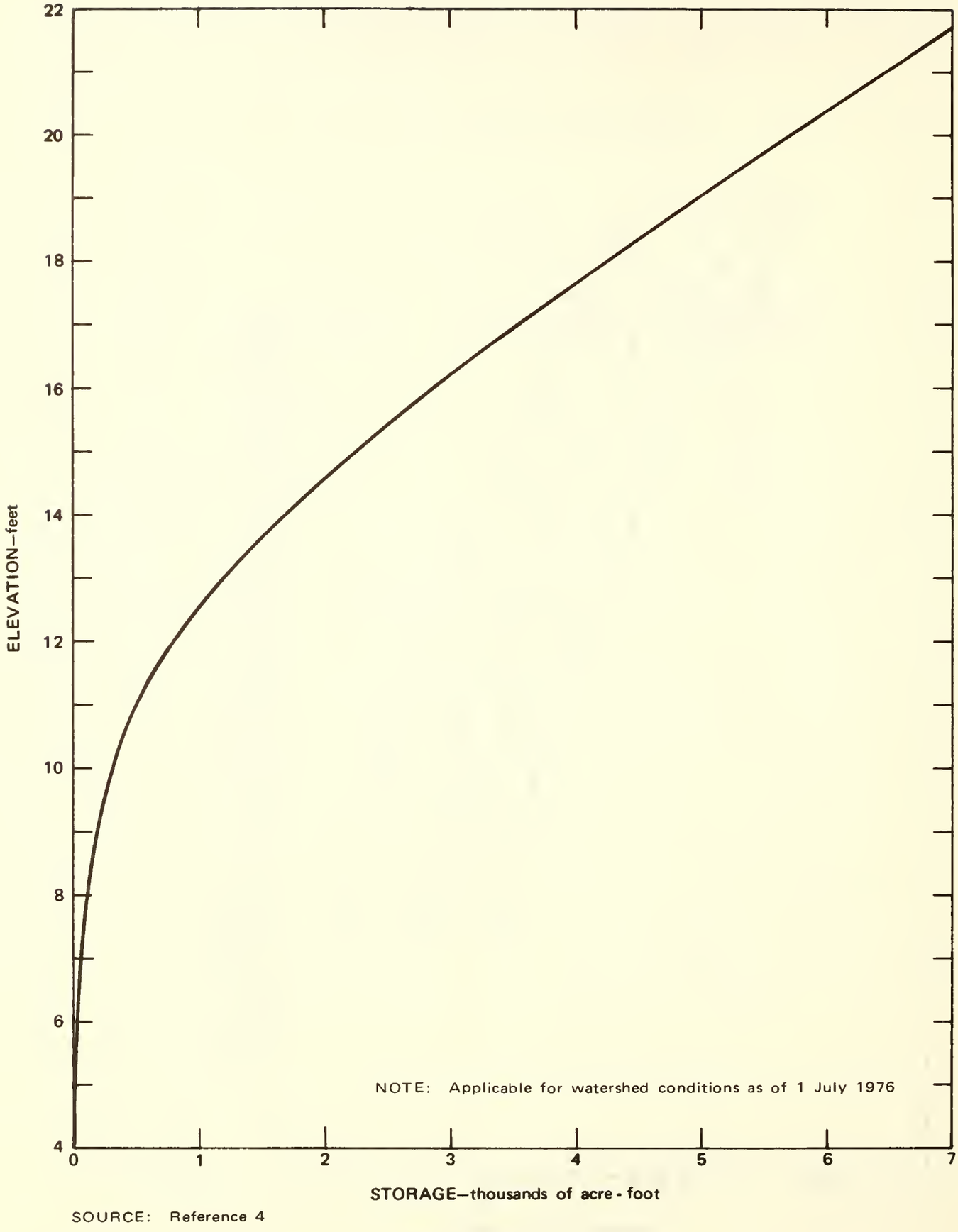
Source: Reference 4.



NOTE: The precipitation intensity curves developed for the area are based upon observed short-term precipitation intensities of the Portland International Airport, Troutdale, Oregon Substation, and published isopluvial maps of precipitation intensities prepared by the National Weather Service. (Precipitation Frequency Atlas, 1973)

SOURCE: Reference 4

FIGURE B-1. PRECIPITATION FREQUENCY CURVES FOR WASHOUGAL AREA



SOURCE: Reference 4

FIGURE B-2. STORAGE–ELEVATION CURVE

APPENDIX C

ESTIMATION OF FUTURE AUTOMOBILE EMISSIONS*

The figures in Table 18 for emissions from present industry -- excluding the industrial park -- are from the Washington Department of Ecology.[27] Total emissions from present industry -- including the industrial park -- were estimated by Pratska[28] based on knowledge of the types and sizes of industries in the industrial park and their control equipment, and rounded to tens of tons per year.

It was assumed that projections of the future population of the Camas-Washougal area by the Regional Planning Council[48] estimate future population without expansion of the industrial park. Projections for Census Tracts (CT) 405.02, 405.03, 414, and 415 in Table 10 were used in this analysis.

One car for every two people, the present car-to-population ratio for Clark County, was assumed.[84]

Employment in the industrial park expansion was assumed to remain at 7.6 employees per acre, the figure for the present industrial park (excluding BPA's storage yard). The total additional population was then based on 4 people per industrial park employee (assuming 0.5 secondary job per industrial park job, 3 people per job, and less 10% for employees living outside the area).

Auto emissions were calculated using EPA composite emission factors for all modes and assuming 10,000 miles per year per vehicle.[85] These factors reflect the planned changes in auto emission standards and the emission rates of all model years of vehicles in the fleet at a given time. The following emission factors were used:

Year	NO_x	HC	CO
1978	4.03	7.78	67.30
1985	2.80	3.55	38.85
1990	2.15	2.56	23.54

The 1990 emission factors were used for the year 2000.

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*See Section V.B.3.

APPENDIX D

CALCULATION OF ECONOMIC IMPACTS*

1. Methodology

Total regional (Portland SMSA+) change in labor income and employment was derived by employing U.S. Bureau of Economic Analysis (BEA) factors and methodology.[88] The general approach was to:

- Estimate the total payroll (P) of the firms that locate in the park.
- Derive the change in gross regional product (DGRP).
- Obtain the total change in gross regional product (TDGRP).
- Determine the total change in labor income (TDLY).
- Determine the total change in regional employment (TDEMP).
- Obtain the total change in personal income (TDPY).

2. Calculation

a. Total Payroll (P)

The average annual income per employee of the present industrial park was $11,400 in 1976.[6] Total annual payroll over the development period of project is shown in Table D-1. Total annual payroll of the industrial park expansion was estimated to be $570,000 for the second year of development (first year of operation), and $12.4 million at full development (year 10).

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*See Section V.D.1.

+Standard Metropolitan Statistical Area.

Table D-1

REGIONAL ECONOMIC CHANGE[a]

Year	Total Employment[b]	Total Payroll (P) (1,000's)[c]	Change in Regional Product (DGRP) (1,000's)[d]	Total Change in Gross Regional Product (TDGRP) (1,000's)[e]	Total Change In Labor Income (TDLY) (1,000's)	Total Change In Employment (TDEMP)[g]	Total Change In Personal Income (TDPY) (1,000's)[h]
1	50	$ 570	$ 1,919	$ 5,229	$ 1 573	157	$ 2,296
2	172	1,961	6,603	17,993	5,412	542	7,901
3	286	3,260	10,980	29,920	9,000	900	13,139
4	400	4,560	15,354	41,831	12,583	1,258	18,369
5	514	5,860	19,731	53,767	16,173	1,617	23,610
6	628	7,159	24,104	65,683	19,757	1,976	28,842
7	742	8,459	28,481	77,611	23,345	2,334	34,080
8	856	9,758	32,855	89,530	26,931	2,693	39,315
9	970	11,058	37,232	101,457	30,518	3,052	44,522
10	1,084	12,358	41,609	113,384	34,106	3,411	49,790
i	5,920[b]	67,488	227,232	619,207	186,257	18,627	271,908
i	9,143[b]	104,230	350,943	956,320	287,661	28,766	419,943

[a]Portland SMSA.

[b]Source: Table 1

[c]Based on the 1976 industrial park wage level: $11,400 per employee per year.

[d](P)/(0.297) = DGRP.

[e](DGRP)(2.725) = TDGRP.

[f](TDGRP)(0.3008) = TDLY.

[g](TDLY)/(ARE) = TDEMP.

[h](TDLY)/(0.685) = TDPY.

[i]Full development (see Tables 10 and 15).

b. Change in Gross Regional Product (DGRP)

The earnings-to-gross regional product ratio for the types of industries likely to locate in expanded industrial park were averaged (see Table D-2), and that ratio divided into total earnings, to obtain the change in gross regional product (see Table D-1).

c. Total Change in Gross Regional Product (TDGRP)

The total change in gross regional product was obtained by multiplying DGRP by the regional economic multiplier (REM) from Table D-2. TDGRP is shown in Table D-1.

d. Total Change in Labor Income (TDLY)

By multiplying the total change in gross regional product (TDGRP) and the ratio of national earnings to gross output for all industries (0.3008), the total change in labor income, including the direct payroll, of those working at the industrial park expansion was obtained (see Table D-1).

Table D-2

EARNINGS TO GROSS OUTPUT RATIO AND REGIONAL ECONOMIC MULTIPLIERS

Industrial Sector	Gross Output	Economic Multipliers
Lumber and wood products	0.239	3.041
Chemicals and allied products	0.193	2.224
Rubber and plastic products	0.273	2.365
Fabricated metal products	0.280	2.977
Electrical equipment and supplies	0.308	2.824
Services	0.487	2.917
Average	0.297	2.725

Source: Reference 88.

e. Total Change in Employment (TDEMP)

Dividing the total change in labor income (TDLY) by the average income per worker (ARE) yielded the total change in employment. The average annual payroll per employee in Clark County in 1975 was $9,330,[47] or $10,000 in 1976 dollars, when adjusted by the Portland-Vancouver Consumer Price Index.

f. Total Change in Personal Income (TDPY)

Personal income in a region is composed of wages and salaries, other labor (e.g. tips), proprietor's income, transfer payments (e.g., veteran's benefits) and dividends, interest, and rents. The ratio of wages and salaries to total personal income in the Portland SMSA averaged 0.685 between 1969 and 1974. The total change in personal income due to proposed project was obtained by dividing TDLY by this ratio. The result is shown in Table D-1.

APPENDIX E

DEFINITION OF THE PORTLAND ECONOMIC REGION*

BEA Economic Region 157 (Portland, Oregon-Washington) includes the following counties:[88]

Washington

- Wakiakum
- Cowlitz
- Clark
- Skamania
- Klickitat

Oregon

- Clatsop
- Columbia
- Multnomah
- Hood River
- Wasco
- Sherman
- Tillamook
- Washington
- Yamhill
- Marron
- Clackamas
- Lincoln
- Polk
- Beuton
- Linn
- Jefferson
- Deschuttes
- Crook

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*See Section V.D.1.

Appendix F

IMPACTS ON SCHOOL DISTRICTS*

A recent study by the Regional Planning Council (RPC) of Clark County, entitled Clark County School Trends and Forecasts,[58] described past and present school enrollments and school facilities. Table F-1 summarizes the current number of schools and current enrollment for each of the four south county school districts. The RPC report also contained projections of school enrollment from 1979 to 1990 by grade levels in the elementary, intermediate, and senior high schools (see Tables F-2 through F-4).

To determine the impacts of the proposed industrial park expansion, the additional school enrollments arising from increased local population growth were estimated. The estimates were made by calculating enrollments from the projected additional population using the ratio of students to the total population.

The student enrollments per 100 persons in Clark County were 23 and 24, respectively, in 1960 and 1970. Projected population and school enrollment figures indicate that 24, 26, and 28 out of every 100 people in Clark County in 1980, 1985, and 1990, respectively, will be students in grades K through 12 Using the appropriate ratios, enrollment increases were predicted from population increases, as shown in Table F-5.

Enrollment projections form the basis for predicting the need for new schools. The design enrollments of elementary, intermediate, and senior high schools are shown in Table F-6.

The RPC projections assumed that a new school is needed when enrollment exceeds the capacity of existing schools by 30% of the capacity of a new school. Table F-7 gives the number of "excess" students that would create the requirement for a new school.

The cumulative increases in enrollments caused by industrial park expansion are shown in Table F-8. The impact on the timing of new school requirements is shown in Table 30, and discussed in Section V.D.7.c.

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*See Sections III.D.5.c and V.D.7.c.

Table F-1

1976 STUDENT ENROLLMENT AND NUMBER OF SCHOOLS
IN FOUR CLARK COUNTY SCHOOL DISTRICTS

School District	Elementary		Intermediate		Senior High		Total	
	Students	Schools	Students	Schools	Students	Schools	Students	Schools
Camas	923	2	559	1	758	1	2,240	3
Evergreen	5,168	12	2,073	2	1,550	1	8,791	15
Vancouver	8,184	19	4,196	5	4,135	3	16,515	28
Washougal	527	3	493	1	559	1	1,579	5
Total	14,802	36	7,321	9	7,002	6	29,125	51

Source: Reference 58.

Table F-2

CAMAS SCHOOL DISTRICT
PROJECTED BASELINE GROWTH

Year	Total	Elementary (K-5)	Intermediate (6-8)	Senior High (9-12)
1979	2,184/2,224[a]	921/938	567/578	696/708
1980	2,186/2,247	922/947	568/584	696/715
1981	2,198/2,270	927/957	571/590	700/722
1982	2,211/2,291	933/966	574/595	704/729
1983	2,272/2,361	958/996	590/613	724/752
1984	2,362/2,449	996/1,032	614[b]/636[b]	752/781
1985	2,442/2,538	1,030/1,070	634/659	778/809
1986	2,531/2,625	1,068/1,107	658/689	805/836
1987	2,568/2,671	1,083/1,126	667/694	818/851
1988	2,595/2,715	1,095/1,145	674/705	826/865

[a]Low/high forecast.

[b]Enrollment predicted indicates need for a new school.

Source: Reference 58.

Table F-3

WASHOUGAL SCHOOL DISTRICT
PROJECTED BASELINE GROWTH

Year	Total	Elementary (K-4)	Intermediate (5-8)	Senior High (9-12)
1979	1,780	577	632[a]	571
1980	1,785	579	633	573
1981	1,730	561	614	555
1982	1,810	586	642	582
1983	1,830	593	649	588
1984	1,960	635	695	630
1985	1,990	646	706	639
1986	2,120	687	752	681
1987	2,120	687	752	681
1988	2,150	697	763	690

[a]Projected enrollment indicates need for a new school.

Source: Reference 58.

Table F-4

VANCOUVER AND EVERGREEN SCHOOL DISTRICTS
COMBINED PROJECTED BASELINE GROWTH

	Total All Grades (K-12)	
Year	Low Forecast	High Forecast
1979	25,690	27,110
1980	26,520	28,120
1981	27,080	29,070
1982	27,660	29,890
1983	28,810	31,390
1984	29,930	32,830
1985	31,320	34,630
1986	32,860	36,610
1987	33,040	37,550
1988	34,620	38,890

Source: Reference 58.

Table F-5

CUMULATIVE INCREASES IN POPULATION AND SCHOOL ENROLLMENT RESULTING FROM THE INDUSTRIAL PARK EXPANSION

Development Year	Year	Camas Area Population Increase[a]	Camas School District Increase	Washougal Area Population Increase[a]	Washougal School District Increase	Vancouver Area Population Increase[a]	Evergreen and Vancouver School Districts Increase
1	1979	50	12	59	14	54	13
2	1980	247	59	288	69	266	64
3	1981	423	102	493	118	455	109
4	1982	598	144	697	167	643	154
5	1983	774	186	901	216	832	200
6	1984	950	228	1,106	265	1,022	245
7	1985	1,125	293	1,310	340	1,210	315
8	1986	1,301	338	1,515	393	1,399	364
9	1987	1,477	384	1,720	447	1,583	413
10	1988	1,671	434	1,946	506	1,797	467

[a]From Table 23

Table F-6

GENERAL ENROLLMENT CAPACITY OF ONE SCHOOL

	Camas School District	Washougal School District	Evergreen and Vancouver School Districts
Elementary	400	400	600
Intermediate	600	600	800
Senior High	1,000	1,000	1,500

Source: Reference 58.

Table F-7

NUMBER OF STUDENTS IN EXCESS OF TOTAL DESIGNED CAPACITY NECESSARY TO REQUIRE ONE NEW SCHOOL

	Camas School District	Washougal School District	Evergreen and Vancouver School Districts
Elementary	120	120	200
Intermediate	200	200	240
Senior High	300	300	450

Source: Reference 58.

Table F-8

CUMULATIVE INCREASES IN SCHOOL ENROLLMENT BY GRADE LEVEL RESULTING FROM INDUSTRIAL PARK EXPANSION

	Camas School District				Washougal School District				Evergreen & Vancouver School Districts			
Year	All[a]	K-5	6-8	9-12	All	K-4	5-8	9-12	All	K-6	7-9	10-12
1979	12	5	3	4	14	5	5	5	13	7	3	3
1980	59	25	15	19	69	22	25	22	64	36	15	13
1981	102	43	27	33	118	38	43	38	109	61	26	22
1982	144	60	37	46	167	53	60	53	154	86	37	31
1983	186	78	48	60	216	69	78	69	200	112	48	40
1984	228	96	59	73	265	85	95	85	245	137	59	49
1985	293	123	76	94	340	109	122	109	315	176	76	63
1986	338	142	88	108	393	126	142	126	364	204	87	73
1987	384	161	100	123	447	143	161	143	413	231	99	83
1988	434	183	113	139	506	162	182	162	467	262	112	93
% of Enrollment in Each Grade Level	100	42	26	32	100	32	36	32	100	56	24	20

[a]All grade levels.

Note: Totals may not add due to rounding.

Sources: Table 25 for enrollment increases; Reference 58 for distribution by grades.

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